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General Articles

THOUGHTS ON THE AUSCULTATION OF THE BOVINE CHEST*

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In the belief that not only is open confession good for the soul, but that where it reveals a lack of knowledge of any particular condition, it should act as a stimulus to an endeavour to elucidate further the mysteries and problems involved, I have marshalled my courage to write this brief paper on "Thoughts on the Auscultation of the Bovine Chest." The subject is as old as veterinary science itself, and yet the great differences of opinion as to the value of auscultation in the diagnosis of pulmonary disease, show the difficulties inherent in the practice. In these modern days, when the tendency is rather to rely almost completely on laboratory methods and various scientific tests, the physical examination of the patient and the diagnosis of disease by observing objective symptoms is not practised with anything like the degree of enthusiasm exhibited by veterinarians little more than a decade ago. While realising the tremendous benefits resulting from the application of modern scientific methods in the diagnosis of disease, it is to be regretted that the older science seems quite erroneously to feel that to a considerable extent it has been replaced. If this paper may serve in even some small measure to emphasise the great importance and value of clinical methods, and the need for further research into the diagnosis of disease by physical examination and the observation of objective symptoms, the writer will be amply rewarded.

Although the auscultation of the bovine chest includes the examination of the heart, pleura and lungs, I propose to deal only with the examination of the lungs, because I must keep my paper within reasonable limits; also because the lungs, possibly, are the organs most frequently examined by the clinician, and are of such vital importance in the differential diagnosis of tuberculosis.

In order to gain the maximum value from auscultation, it is essential to understand the anatomy, histology and physiology of the various parts concerned, and their relationship one to another, so that the clinician approaches the patient with a clear mental picture of the audible sounds in the normal animal. I do not propose, even if time permitted, to weary you with a laborious, and, I dare say, quite unnecessary account of the anatomy, physiology and histology of the various structures involved, but rather to refer briefly to certain aspects of these subjects which have a very direct bearing on the practice of auscultation.

I trust I may be forgiven for reminding you that the diaphragm projects some considerable distance into the thorax and that the rumen is in contact with it on its left posterior surface, the liver in the centre and on the right, and on the lower right side the reticulum. As a result of this anatomical arrangement, auscultation on the right side, especially over the posterior part of the thorax, is more satisfactory than on the left side, owing to abdominal sounds and muscular contractions of the walls of the rumen.

The rhythmical sounds created during mastication and chewing the cud, also the movement of the food bolus and the regurgitation of gas can be heard quite clearly, so that it is essential, if the best results are to be obtained from auscultation, to examine the animal as far as possible when none of these functions is in operation.

Difficulty may also be caused by the twitching movement of the panniculus, especially in the summer and early autumn, when the flies are troublesome. I have experienced so much difficulty from this source that it is now my practice to spray the animal with "Flit" or some other anti-fly dressing, which I find invaluable.

Very occasionally one encounters nervous animals that protest so strongly against the application of the phonendoscope, especially in the region of the elbow, that auscultation is of little value—an observation which applies equally to really wicked beasts.

The sounds created in the lungs during the process of respiration may be divided very broadly into normal and abnormal or pathological.

NORMAL SOUNDS

The normal sounds are commonly called bronchial and vesicular or alveolar. The bronchial sound, as its name implies, is created by the to and fro movement of the air through the bronchi. The bronchial sound is most

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marked at the entrance to the chest and as the bronchi become progressively smaller in calibre, the sound decreases in volume until it is lost in the vesicular murmur. On account of the gradual change from the bronchial to the vesicular sound, which is best determined by auscultation, it would appear inadvisable to attempt to indicate where the one sound ceases and the other begins by any anatomical description of the respective areas, especially as the two sounds can be readily distinguished.

The vesicular murmur arises when the bronchi become sufficiently reduced in calibre to lose their bronchial note. I am well aware that in making this statement I may be bringing a "hornet's nest about my ears," but I am determined not to repeat commonly-accepted views which I do not believe for fear of the consequences, and if I digress from the accepted teaching, particularly of the veterinary textbooks, it is because I have found them of little value or help in the diagnosis of disease by auscultation. While expiration is slightly longer than inspiration in the respiratory phase, the expiratory part of the vesicular murmur is appreciably shorter than the inspiratory. The vesicular murmur is least distinct in thickly-coated and in fat animals, but this rarely affects adversely the practice of auscultation as most of the bovines we have to examine by this means are dairy cows in working condition, if I may be permitted the phrase.

It may not be inappropriate here to remind you that the air taken into the lungs during quiet respiration is generally referred to as the tidal air, and that after this the air inhaled by the deepest inspiration is called the complemental air. Similarly, the air expired from the lungs by a deep expiratory effort is called the supplemental air, and a certain amount of air, generally referred to as the residual or reserve air, remains constantly in the lungs. The residual air acts as a cushion and so prevents the inspired air from coming into direct contact with the alveoli except in the process of diffusion. If this statement about the residual air told to us by the physiologists is correct—and I believe it to be true—then the alveoli are not exposed to a direct inrush of air but have a normal quantity always present, which must prevent their alternate collapse and expansion during respiration.

From this premise, I am going to assume that in health the audible sound, generally referred to as the vesicular murmur, does not have its origin in the alveoli but in the small bronchioles leading to the area of lung containing the residual air. As this matter is obviously of importance in the origin of different kinds of râles and consequently the differential diagnosis of various pulmonary conditions, it will be referred to later.

Abnormal or Pathological Sounds

These sounds are, as a rule, classified in a great variety of ways. Commonly they are divided into bronchial and pulmonary, which are sub-divided into moist and dry, and then follows a host of names to indicate the different kinds of sounds that may be heard, with an attempt to describe them by referring the reader to familiar sounds that they are supposed to resemble. I envy such authors their fertile imagination and brilliant descriptive powers, but I must confess to a certain disappointment when I have attempted to hear a sound "like the bass note of a violin or the cooing of a dove." I therefore do not attempt to describe or imitate any of the pathological sounds which have their origin in the lung. It would appear necessary to say, however, that owing to the variety of sounds of abdominal origin, the only sounds that can be considered indicative of pulmonary disease are those that definitely synchronise with the respiration, *i.e.*, that occur at regular intervals in the respiratory phase, although they need not, and usually do not, persist, but may, and often do, recur.

It therefore follows from what has been said that an infection taken in in the inspired air to reach the alveoli must progress either in the diffused air, by way of the lymphatic vessels, or by simple continuity of growth along the minute bronchioles to the infundibulum and the alveoli, whereas a haematogenous infection will be carried directly to the alveolar walls. In an aerogenic infection the first evidence of disease is likely to be found in the smaller bronchioles, and in the alveoli in a haematogenous dissemination, and in either case no auscultative evidence will be found until the minute bronchioles become involved.

In early miliary tuberculosis of the lungs, although the lesions individually are small, the amount of pulmonary tissue involved is considerable, and yet it is rarely that one is able to make out any definite râles on auscultation. The respirations are usually hurried and coarse or bronchial, but similar sounds would be heard if the respirations were increased from some cause other than disease. It would appear that the absence of any definite râles is to be explained by the fact that the lesions have their origin in the alveolar walls which normally contain the residual air, and consequently we should not expect to hear any pathological sounds until the minute bronchioles become involved. This phenomenon, in my opinion, explains why auscultation is often so disappointing in bovines in which from other symptoms we strongly suspect miliary tuberculosis, and yet we are unable to complete the evidence because what one would expect to be

the most obvious link in the chain of symptoms cannot be determined.

In pulmonary tuberculosis generally, lesions are usually found adjacent to bronchioles or bronchi which are commonly involved, and in these cases, which form the majority of animals that come within the scope of the Tuberculosis Order of 1925, auscultation is of the utmost value. Experience leads me to assert that the râles heard on auscultation in tuberculosis are mostly due to the presence of pathological secretion in the bronchioles or bronchi derived from the activity of the tubercle bacilli in the pulmonary tissue, and that the actual cause of the sounds is the to and fro movement of the air through the secretion. While in some cases a great variety of sounds can be heard, the most characteristic are high-pitched notes, sometimes almost a slight whistle, a sighing sound, a clicking sound, vibration notes of different tones, and crepitation. If we imagine bronchioles and bronchi of different calibre containing secretion in varying quantities with air passing to and fro over it or through it, I think we can visualise the cause of variety of the sounds. Where, for instance, the lumen of the bronchiole is much reduced by the accumulation of secretion within it, a high-pitched note will be produced, and where fine threads of mucus become stretched across the lumen a vibration note will arise, and the smaller the calibre of the vessel, the higher pitched will the note be. Deep, vibrating notes indicate involvement of a large bronchus. Similarly, other sounds will depend on the amount and character of secretion in the vessel. Whatever kind of sound is heard we cannot be definitely satisfied that it has its origin in diseased pulmonary tissue unless it synchronises quite definitely with the respiration. That is an essential. Sometimes these sounds persist, but as a rule they disappear for a varying time and then recur, except in advanced cases. It is not uncommon to locate a râle or râles during auscultation and, after the animal coughs, to find that the sound has disappeared from the particular point where it was located, to return later.

The Significance of Sounds in Different Parts of the Lung

While it is essential in making a diagnosis to take into consideration all the symptoms present, experience gained in a careful critical clinical and *post-mortem* examination of a very large number of cases indicates that râles heard in certain areas have a strong clinical significance, and often point the way to correct diagnosis.

Pneumonia in the bovine generally affects the lower part of one or both lungs and consequently the râles to which this disease gives rise will be most pronounced in the lower third of the chest wall. Râles may sometimes also be heard in the middle or upper third of the chest, but these are conducted sounds, having their origin in the pneumonic area or the large bronchi leading to it. These conducted sounds may be distinguished by following them in the direction of the increased sound, when it will be found that the maximum note is either at the pneumonic area or in the bronchus by it. When the pneumonic area has become solid, an appreciable area with complete absence of sound can be detected.

At this juncture, when mentioning diseases that give rise to extensive pulmonary râles, it would appear desirable to refer to certain cases occasionally encountered where enlargement of the retropharyngeal lymphatic glands through pressure on the larynx, and occasionally the first few rings of the trachea, causes widespread râles in the lungs without any obvious evidence of their true origin. In these cases the lung may be normal, the sounds heard having their origin in the larynx and being conducted to the lungs. If the phonendoscope is applied to the trachea the real cause of the trouble can be readily detected. Difficulty arises, however, where pulmonary disease exists along with conducted sounds from the larynx and may be distinguished by applying the phonendoscope to the trachea as mentioned before and noting a difference in type and character between the conducted râles and those that have their origin in the diseased lung.

Cases where the enlargement of the retropharyngeal lymphatic glands is accompanied by roaring are so obvious that they need not be referred to, except to say that auscultation in such cases is practically useless.

In traumatic pneumonia the foreign body enters the thorax from the reticulum which is applied to the diaphragm on the lower right posterior side, and consequently it is the right lung that is as a rule first affected and more extensively so.

Tuberculosis of the lungs, other than miliary, may affect any part of the lung, but as a general rule in a clinical case of pulmonary tuberculosis lesions are present in the upper part of one or both lungs. It therefore follows that any pathological sounds heard in the upper third on either side of the chest wall strongly indicate tuberculosis. This aid to diagnosis, like most others, is not infallible, as fluke abscesses and other conditions in this region may sometimes give rise to similar sounds, but I have found it extraordinarily reliable and attach great importance to it.

In the case of vesicular emphysema, râles of the same type can be heard all over the chest on both sides. Expiration is forced, resulting in the well-known swinging, jerky movement of the flanks similar to that seen in broken wind in horses, and the expiratory phase is longer than the inspiratory.

Extensive pulmonary tuberculosis may give rise to râles that can be heard all over the chest wall, but the character of the sounds varies in different parts, and the inspiratory sound is of longer duration than the expiratory.

In dealing with cases where definite râles varying in type and character can be made out over a fairly wide area with the inspiratory sound longer than the expiratory and thus strongly indicative of tuberculosis, it would appear advisable to point out that cases of bronchitis do occur occasionally in cattle that present exactly the same sounds on auscultation and cause difficulty on a first examination. In all such cases I have encountered there has been a steady improvement, shown by a decrease in the extent and character of the râles ascertained at subsequent clinical re-examinations.

It would appear, then, that râles heard in certain positions are strongly indicative of certain diseases. If, for instance, râles are heard in the lower third of the chest and absent in the upper third, it is highly probable that the case is one of pneumonia, non-tuberculous in character; and if râles are heard in the upper third of the chest only, the most likely cause is tuberculosis. Also, if râles of the same type are heard uniformly all over the chest, pulmonary emphysema is almost certain to be the cause, whereas râles varying in character and intensity over a wide area, almost certainly indicate pulmonary tuberculosis. In addition, there is also the variation in length of the inspiratory and expiratory part of the vesicular murmur to which I have already referred.

Great difficulty in diagnosis arises, however, when two pulmonary conditions co-exist as occasionally happens, but, even in such cases, if due consideration is given to all the various factors concerned, and the relative significance of each is carefully examined and analysed, an exact diagnosis is not impossible.

In conclusion, I should like to point out that in presenting this brief paper I thoroughly realise that my courage is far greater than my ability, but I plead justification in the great importance of the subject to every veterinary surgeon concerned with the clinical examination of cattle, and also because the subject, although entirely a veterinary one, has not received the attention it deserves at meetings of Veterinary Societies. The auscultation of the bovine lung bristles with difficulties, but is a matter of such paramount importance to us, that we should do well to give it a large share of our attention and effort. I admit readily that although it is a topic on which I speak with great diffidence and little knowledge, I do not wish you to treat me tenderly on that account, but rather would I invite your most searching and virile criticism, because by that means we are more likely to gain an increased knowledge of the subject.

THE MODIFIED METHYLENE BLUE REDUCTION TEST FOR THE GRADING OF RAW MILK ON THE BASIS OF BACTERIAL CLEANLINESS*

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The title of this paper has been selected so as to define and limit the scope of the subject under consideration. This is essentially the grading of milk on the basis of bacterial cleanliness. The question of safety, that is its freedom from pathogenic organisms, is not discussed, nor is any criticism offered of our present practice of paying perhaps more attention to the cleanliness than to the safety of milk. The present paper is concerned essentially with a test which can be applied in practice to all milk destined for human consumption, and not merely to that of a few high-grade producers which constitutes only a small fraction of the total milk at present consumed.

Before considering the actual tests available for assessing the bacterial cleanliness of milk, it will be well to examine briefly some of the principles on which any rational system of grading should be based.

The first principle is that, since the answer given by any test is determined by multiple factors involved in the production and subsequent handling of the milk, by the care with which the milk is sampled, and by the time-temperature conditions under which the sample is taken and kept prior to analysis, it follows that it is unwise to pay too much attention to the results of any single examination. Atmospheric temperature alone has an extraordinarily important effect on the apparent cleanliness of milk, and many a producer, whose milk in hot weather contains millions of organisms per c.c. a few hours after production, has found that in cold weather it is up to the bacteriological standard of Grade A milk. For this reason it is important to lay down separate standards for summer and winter.

The second principle is that whatever standard is laid down, no producer should be penalised on the basis of any one sample. Since with so many human and environmental factors involved it is extremely difficult for the ordinary farmer to produce milk of a uniformly high degree of cleanliness all the year round,

*The Editorial Committee invited Professor Wilson to write this article because of the many requests the Committee has received from veterinarians for a concise, informative account of the above test. For a description of the technique of the test, readers are referred to the issue of this journal of March 7th (16. 10), page 284.

no more than a certain proportion of samples should be expected to conform to the standard.

The third principle is that, since the results of examination of any one sample are affected by a great many factors, it is foolish to attempt to make too many sub-divisions in the cleanliness of milks. From a public health point of view probably only two divisions need be made on the basis of cleanliness, namely, into (*a*) milk that is suitable, and (*b*) milk that is not suitable for human consumption in the liquid state.

If these principles are accepted it follows that what is required for bacteriological grading is a simple, inexpensive test, with a small experimental error, which can be used on a large scale by relatively unskilled workers. With the aid of such a test it should be possible to conduct weekly or fortnightly examinations on the milk of every dairy farmer in the land, and so ensure that milk below a certain standard of cleanliness was prevented from reaching the liquid market. In the past far too much attention has been devoted to the control of high-grade milk which has formed only a very small proportion of the total supply available to the public. It is suggested that control should in future be exercised on the milk of all producers; otherwise much of the effort of the best class producers will be nullified by admixture of their milk with that of poorer quality coming from producers who are making little or no attempt to produce clean milk.

Bearing this purpose in mind, we may now consider the various tests that are available for assessing the bacteriological cleanliness of milk, and decide how closely they conform to the desiderata just laid down. For the sake of brevity we may omit references to such tests as the sediment test, leucocyte content, the Breed smear method, and the Brom-thymol blue test, since none of these seems to be suitable for the general grading of all milks.

Probably the test which has in the past occupied the most important place in the minds of producers, veterinarians, and consumers alike is the *Plate Count test*. Ostensibly the plate count measures the numbers of bacteria in milk, but in fact it does not. On account of the difference between various species of bacteria in their nutritional, respiratory, and temperature requirements, and on account of the gross irregularity in the distribution and clumping of organisms in the milk, the plate count merely registers the number of bacterial units capable of multiplying under the particular conditions selected. Since the average number of bacteria per clump is variable from one milk to another, and from time to time in the same milk, and since these clumps may disintegrate to a quite uncontrollable extent during the process of dilution, the figures yielded by the plate count are arbitrary, not strictly comparable from milk to milk, and have no absolute significance. The technique of the plate count is complex, difficult to standardise, and requires highly skilled workers. Even under favourable conditions, with the method standardised as far as possible, the experimental error is very large, and on any one count an allowance of 90 per cent., or even over, may have to be made. The quantitative expression of the results in figures extending over a wide range affords a fictitious appearance of accuracy which leads, not only in laymen but often in public health officials, to a wholly unjustifiable feeling of confidence in their value.

Another test on which considerable reliance has been placed in the past is the *Coliform test*. Prolonged experience of the coliform test in this country has shown that in the analysis of *water* it affords the best and most delicate index of excretal pollution. The reasons for this are mainly (1) that 90 per cent. or so of waters giving a positive presumptive coliform reaction in MacConkey broth are proved on further examination to contain typical *Bact. coli* of excretal origin; (2) organisms of the *coli* type in water are frequently derived from human excretal material, and (3) coliform organisms do not as a rule multiply in water under natural conditions, so that an estimate of their numbers affords an index of the minimal amount of excretal pollution that has occurred. These fundamental premises on which the value of the coliform test in water is based do not, however, apply to *milk*. The majority of coliform organisms in raw milk are not of the true faecal *coli* type. Most of them are derived from other less objectionable sources. Even the presence of faecal *coli* organisms is no criterion of direct excretal pollution. Many of these organisms may have come indirectly from unsterilised milk vessels on the surface of which they have been growing perhaps for several generations. Moreover, unlike water, milk affords an admirable medium for the growth of coliform bacilli, so that unless the milk is examined immediately after production or is kept at a very low temperature, an estimation of the coliform bacilli affords only a very imperfect index of the degree of the original contamination. Though contamination of milk with cow dung will result in the presence of coliform bacteria in the milk, it will be realised that the reverse conclusion does not hold true; that is to say, it is unjustifiable to conclude that milk containing coliform bacilli has necessarily been contaminated with manure. The coliform test in milk, therefore, does not afford us that specific qualitative information which it does with water, and adds comparatively little to the information already yielded by the plate count.

In Scandinavian countries, and in the United States, a method known as the *Methylene Blue Reduction test* has been in use for several years for the routine grading of raw milk. The general principle of the test may be briefly stated as follows. Methylene blue is a dye that exists in an oxidised and a reduced condition. Its addition to a fluid containing a reducing system is liable to be followed by its reduction from the blue oxidised to the colourless reduced state, and the rapidity with which this occurs will depend on the amount of oxygen present and the activity of the reducing system. Milk contains a natural reducing system dependent to a considerable extent on the fat content, but it is insufficient to reduce methylene blue under ordinary aerobic conditions. If bacteria are allowed to grow in the milk they use up the dissolved oxygen, and produce themselves a reducing system which augments that naturally present in the milk. The more bacteria there are present the more rapidly they grow, and the more actively they give rise to reducing substances the shorter will be the time in which the methylene blue is decolorised. The reduction time, therefore, may be regarded as a general measure of bacterial activity in the milk. It is not an exact measure of the numbers of bacteria, because not all bacteria are equally active in absorbing oxygen and in forming reducing substances, but it bears a very close general relationship to the numbers of bacteria present.

In the past the reduction test has been carried out by adding 1 c.c. of standard methylene blue solution to 10 c.c. of milk, incubating the tube in a water bath at body temperature, and noting the length of time taken for the decolorisation of the dye. The great objection to this method is that the fat rises to the surface, carrying with it a considerable proportion of the organisms. Since the reducing enzymes are very closely related to the fat, the result has been that the main reducing action has been concentrated on the surface of the milk instead of throughout the whole column. A *modified method* which has been introduced by my colleagues and myself, consists in corking the tube and inverting it at half-hourly intervals so as to keep the fat and the attached organisms more or less uniformly distributed throughout the milk. The effect of this very slight but important modification is to ensure a more regular reducing action throughout the milk and to shorten the reduction time considerably.

The modified methylene blue reduction test, besides being simple, inexpensive, easy to carry out, and affording results within a few hours, possesses certain scientific advantages over the plate count. In the *first* place, the experimental error of the test is very small—only about one-twentieth of that of the plate count—and consequently the enormous divergencies that are at present inevitable between the results of different analysts examining samples of the same milk need no longer occur. In the *second* place, the reduction test does not appear to be seriously affected by the degree of aggregation of the bacteria in the milk. Whether the organisms are distributed individually or are arranged in clumps the reduction test provides an index of their total metabolic activity. The results of the plate count, on the other hand, are extraordinarily dependent on the amount of clumping. A milk in which the organisms are distributed chiefly in pairs and small groups, may have a plate count ten times as high as that of another milk having exactly the same number of organisms which are, however, arranged mainly in large groups. The *third* advantage is that the reduction test is considerably more sensitive to the growth of bacteria than the plate count. After the production of the milk there is generally a "lag" phase during which bacterial growth occurs without actual division of the organisms. During this lag phase, which may last for some hours, the plate count remains stationary, while the reduction time, on the other hand, falls rapidly. This, of course, is due to the fact that the organisms, though not actually increasing in numbers, are increasing in size, are using up oxygen, and bringing about certain changes in the chemical constitution of the milk. The keeping quality of the milk is definitely less at the end than at the beginning of the lag phase, yet the plate count gives no indication of this. The plate count, in fact, gives merely a static picture of the milk, while the reduction test affords a dynamic picture. Since, so far as cleanliness is concerned, we are interested in bacteria in milk mainly because of the evil effects they may have on the keeping quality, it is clear that the reduction test in giving us a measure of their activity is affording us more information than the plate count, which gives only an approximate measure of their numbers.

The modified methylene blue reduction test that has been described seems to fulfil most of the requirements demanded of a test for the routine grading of raw milk. Observations in the field have shown that on the average the results of this test are highly correlated with those of the plate count though, of course, in individual milks the two tests may give divergent results. Further, the reduction test seems to afford as good an index as the plate count, if not better, of the sanitary conditions governing the production of the milk and of its keeping quality. Consideration of its advantages must not, however, be allowed to obscure its limitations. Milk may suffer from many defects, and in order to detect each of these a separate test is generally required. If a

thorough examination was to be made of any individual sample of milk, at least six or eight tests would be required, each of them furnishing an answer to a different question. The reduction test does not pretend to pick out every fault in the milk, nor is it suitable for the examination of the milk of individual cows or for freshly pasteurised milk. It is not a specific test for mastitis, any more than the plate count is, though there is reason to believe that mixed milk coming from a herd affected with mastitis will behave less favourably than that from a normal herd. All it pretends to do is to afford an index of the degree of general bacterial contamination of the milk at the time of examination. It is essentially a general test for bacterial cleanliness and keeping quality, which is suitable for the control of raw milk supplies. Its use must not preclude the employment of other tests such as the Breed smear method, the sediment test, the laboratory pasteurisation test, and tests for the presence of mastitis streptococci, which may be required for special purposes.

Whatever bacteriological test is selected by which to control the cleanliness of milk supplies, it is important to agree on some uniform method of sampling. At the present time milk is generally collected on the farm and conveyed to the laboratory in an iced container. Since it is impossible to collect all samples at the same time after milking, and since the length of time during which the milks are exposed to atmospheric temperature influences the result of any bacteriological examination, the present method is frequently unfair to producers whose milk happens to be sampled some considerable time after production. Moreover, experience has shown that it is very difficult to assess the bacterial cleanliness of a milk on a sample which has been collected immediately after milking. The difference under these conditions between milk produced in a cleanly manner and milk produced without any particular regard to cleanliness is not very great, and it is not till the milk has been allowed to stand at a suitable temperature for a sufficient length of time that a real difference becomes apparent. In milk produced under cleanly conditions little bacterial multiplication will occur for several hours, whereas in dirty milk bacterial multiplication sets in rapidly and the contamination which was originally latent becomes abundantly manifest. It is therefore suggested that samples of milk produced in the morning should be collected at any time during the day, kept at atmospheric temperature till 6 p.m., stored in the refrigerator overnight, and then submitted to examination. Evening samples should be left at atmospheric temperature till 10 a.m. the following morning, and then examined directly. In this way the milk of every farmer will be exposed to approximately the same time and temperature conditions before the sample is examined, thus doing away with the present unsatisfactory system. The actual process of collection will, of course, be rendered very much simpler, because the milk samples will not have to be put straight away into a cumbersome ice-box outfit.

The method, therefore, that is suggested for the routine grading of raw milk is to carry out the methylene blue reduction test on morning or evening samples of milk which have been collected and treated in the way just described. The exact standard to be laid down for the reduction time need not concern us here, since we are discussing principles of grading, rather than ministerial regulations, but whatever time is decided on, four-and-a-half or five-and-a-half hours for summer milk, five-and-a-half or six-and-a-half hours for winter milk, it must be understood that this standard refers only to samples of milk left at atmospheric temperature for the prescribed length of time and not to any sample of milk examined at any time after production. The standard time for the reduction test is essentially dependent on the preliminary storage of the sample at atmospheric temperature. Under these conditions it is hoped that a standard will be selected to which 75 per cent. of samples of milk of Grade A standard taken at regular intervals throughout the year will be able to conform. If, of course, a higher standard is required, such as that of Certified milk, there is no difficulty in increasing the length of the reduction time, since the modified test, unlike the original, appears to be perfectly satisfactory for the examination of high-grade as well as of medium- and low-grade milk.

Summary

(1) The general principles of grading milk on the basis of bacterial cleanliness are discussed.

(2) After an examination of the most important available tests, reasons are brought to show that the Modified Methylene Blue Reduction test is peculiarly well suited for the grading of raw milk. This test gives results which are on the average very similar to those of the plate count, but with much less expenditure of time and material, and with a much smaller experimental error.

(3) Whatever test is used it is recommended that in the examination of producers' milk the sample should not be iced, but should be stored at atmospheric temperature for 12 to 18 hours before examination. This preliminary incubation enables the latent contamination of milks produced under bad sanitary conditions to become manifest, and greatly facilitates the differentiation of initially clean from initially dirty milks.

Sir John M'Fadyean

DIAMOND JUBILEE OF GRADUATION AS M.R.C.V.S., APRIL 20TH, 1936

IT is this week our happy and pleasant duty to offer congratulations to the illustrious octogenarian who entered the ranks of our profession 60 years ago, his diploma bearing the date April 20th, 1876. We are glad to learn that he enjoys good health, and that since his retirement from the Principalship of the Royal Veterinary College, Camden Town, in 1927, he finds among pleasant surroundings at Leatherhead his great life-work as veterinary scientist continues to afford him absorbing interest and that busy life which some of his earnest well-wishers hoped in their messages for him at the time of his retirement he would be able to lead and which "makes busy men grow old slowly." We shall look forward hopefully to any fruits of his great experience that may be forthcoming from the reflections of his richly-earned leisure. We are thankful at this time that his wisdom and judgment remain at the disposal of the Council of the body corporate, for we hear that at the meetings of the Council his keen vigour and clarity of mind seem unimpaired. We trust that his days will yet be prolonged, in happiness and comfort, ministered to him now as it is, we understand, by his daughter, Lady Stockman, the widow of his devoted pupil and colleague, whose sad loss we had cause to lament ten years ago. We extend to her also our good wishes.

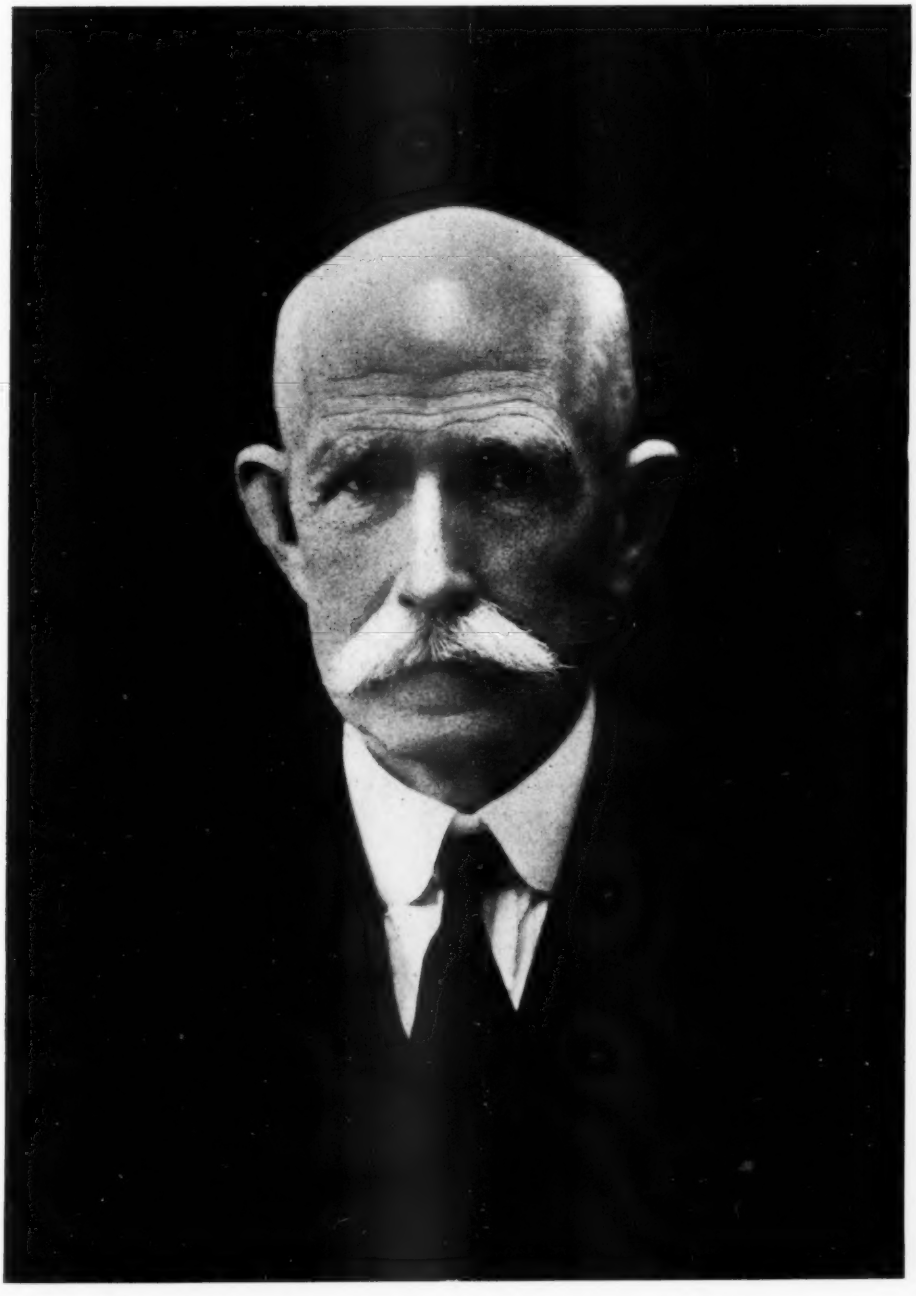
Be it said to the lasting credit of our small profession that during the lifetime of Sir John M'Fadyean it has never been slow in expressing recognition of his great merits and paying generous tribute to him for what he has achieved for its advancement. What he has laboured for and done has become largely part of an established order, and a newer generation inured to this order may now be growing up who perhaps will not be able to comprehend the gratitude and respect amounting often to veneration felt by his nearer contemporaries towards the man himself and his work. The tributes have ample record in our periodicals and his memory has already become enshrined as a tradition in the minds of the large body of our profession that have long come under the influence of his teachings and example. We cannot refrain from quoting in full a short leader written in this journal (November 11th, 1905, p. 327)—it must have been written by the editor, Sir John M'Fadyean's great clinical contemporary and friend, William Hunting—over 30 years ago, when Sir John had already become established securely at the highest pinnacle in the regard of his profession.

"The bestowal by H.M. The King of a Knighthood on Professor J. M'Fadyean is an honour to our foremost member, at which the whole profession will rejoice.

It is an honour well deserved. No man has worked more unceasingly and successfully for the advancement of comparative pathology and veterinary science. How many Select Committees and Royal Commissions he has assisted to arrive at truth we do not remember, but they are numerous and were all directly connected with State Medicine or Veterinary Hygiene.

Sir John M'Fadyean's honour is an honour to the profession he leads, and it might be well, as it would be pleasing, if his fellow members of the veterinary profession took an early opportunity of showing their appreciation. We should suggest a dinner rather than an oil painting which might come later when he would appear more venerable."

The projected special banquet was not only held (January 4th, 1906), but so great was the exultation in the profession at the rare honour which it felt had been conferred upon it as a reward of real merit that, as a later leader says, "not in the history of man has there been a more successful function," and after hearing Sir John speak, "none of his listeners left without an inward acknowledgement of the pre-eminence he so justly holds in the veterinary profession." And the oil painting did not have to wait for its execution until its sitter had become "more venerable." We learn from a leader written early the following year (March 9th, 1907), referring to the ceremony at which a replica of the painting which now hangs on the walls of the Council Chamber of the Royal College of Veterinary Surgeons was presented to Sir John at the Royal Veterinary College, that "this marks the close of perhaps the most notable and spontaneous expression of goodwill towards one man that has ever emanated from the profession in England. . . . Most subjects which arouse the veterinary profession to action are more or less controversial, and it may be a long time before we are all perfectly agreed again in any movement, as we certainly have been in this. . . . Looking back in the future upon the year 1906, it will be pleasant to recollect that the profession fully recognised the worth of the man who, in so many directions, did so much towards its advancement." So there it hangs, the well-known painting of Sir John M'Fadyean, in our Council Chamber, the portrait of a tall, spare, upright man in his prime, looking out onto the world with a firm and easy confidence. On the opposite wall, as if at last smiling deferentially towards him, is the portrait of a man who in his day and in other ways won also the high esteem and gratitude of the profession, the old adversary of his younger days, Professor William Williams. The occasion which the great-hearted William Hunting thought might



Sir JOHN M'FADYEAN, M.B., C.M., B.Sc., M.R.C.V.S., Hon. LL.D. (Aberd.), F.R.S. (Ed.).

Late Principal of the Royal Veterinary College, London. President of the Royal College of Veterinary Surgeons, 1930-31. President of the Tenth International Veterinary Congress, London, 1914. President of the Organising Committee of the Eleventh International Veterinary Congress. Vice-President of the Permanent Commission for International Veterinary Congress. Honorary Fellow of the Royal Society of Medicine. Honorary Foreign Correspondent of the Academy of Agriculture and the Academy of Medicine, France; of the Royal Academy of Medicine, Belgium, and of the Med. Chir. Society, Bologna. Honorary Associate of the Royal College of Veterinary Surgeons. Founder and Editor of the "*Journal of Comparative Pathology and Therapeutics.*"

be a long time in coming round, when all the profession would be agreed in a movement again, had indeed to wait for just over 20 years, and it was again to do honour to Sir John M'Fadyean. This was the occasion of his retirement in 1927 from the Principalship of the Royal Veterinary College, Camden Town. Moving tributes were universally paid afterwards to him on behalf of the profession, as when he was presented in token of sincere gratitude with the highest honour within the award of the Council, R.C.V.S., the Honorary Associateship, and again with the handsome gifts at the Annual Dinner, R.C.V.S., in 1928, for which individual subscriptions were limited to a small sum (as the purpose was to afford large numbers an opportunity to mark their appreciation), and later again when he was presented with the first award of the Fellowship Diploma, *honoris causa*, in 1933. And there now pervaded these tributes something that had seemed to grow upon the consciousness of his colleagues in the profession during the intervening 20 years, in spite of all differences and misunderstandings he might have had with some of them in the meantime: this was that they recognised in him not only a redoubtable master in his calling, but also a great gentleman. The greatest moment of his life was attained, so he declared at his banquet—and we can well believe that it was no light figure of speech—when he presided over the International Veterinary Congress held in London in 1930. Many of his hearers could not help but inwardly regret that the cruel circumstances of the outbreak of the Great War had robbed him of the opportunity of making that utterance 16 years earlier, at the International Congress of 1914, for which he had planned and worked so hard. He had then fully earned the satisfaction of having achieved the consummation of his long labours. But in the face of added difficulties he carried on, not seeing his way to retire from responsibilities which would have daunted the spirit of many younger men, as Principal of the Royal Veterinary College, Professor of Pathology, and Director of the new Research Institute at Camden Town, until he had passed the age of 73 years. We believe him again when at the Annual Dinner, R.C.V.S., in 1928, in acknowledging a gracious tribute paid to her by the President (Colonel Brittlebank), he said that the best thing that ever came his way was to get the eldest daughter of Professor Walley for his wife. It was by sad fate, we all felt, she was not to survive long to enjoy with him relaxation from the strain of a life consecrated to strenuous duty.

What more can we add now to all the tributes that have been already paid to Sir John M'Fadyean? To celebrate a Diamond Jubilee, one must take under review the mutual impact of one's subject and his times over a period of 60 years. This is fairly easy for a middle-aged writer with the aid of ordinary human memory when the period does not extend beyond 25 years, as when a survey of this kind is called for on the occasion of an ordinary Silver Jubilee. But there are few who remain alive to appreciate with faculties undimmed with the passage of years the evolution of human character when its mainsprings are to be traced to happenings of over 60 years ago. Would that the founder of our journal, Hunting, were still alive to place on record, as in many ways only he could, an adequate appreciation on the present occasion. Many older members of the profession aver that only those can appreciate fully his merits who can recall what Sir John M'Fadyean did over 40 years ago when he came as a young man of 38, already with a great reputation, to the London College and converted what has been described as a bear-garden into an orderly teaching institution. Some even older have told of the prodigious worker who restored the Dick College to eminence as a teaching centre after threatened extinction through competition with a powerful local rival. Then large numbers of men well into middle age retain vivid impressions of the sense of authority prevailing in the London College over a long period of years when he taught the classes of pathology and post-graduate classes during his Principalship. The period in so far as it marks almost half-way in the whole history of veterinary education in this country and covers entirely the growth of veterinary science as opposed to what had been merely the craft of the veterinarian, cries aloud for historical treatment. Happily, there is in our veterinary periodicals and other printed matter abundant documentary evidence of the progress made during the period which will render this task easy. A cursory perusal of this evidence brings out at once the outstanding contribution of Sir John M'Fadyean, in veterinary organisation, education and science. What he has left on record in the journal he founded in 1888 and has continued to edit almost single-handed ever since then, in contributions to the discussions at our "National" from 1886 onwards (in that year he read a remarkable long paper, the first real record of anything worthy to be ranked as veterinary science according to modern conceptions, in collaboration with a young colleague who was to achieve great distinction later in medical pathology, G. Sims Woodhead), in the reports to the Royal Agricultural Society, and elsewhere stand out as the most exquisite examples of their kind in veterinary literature, when we give both these words their fullest cultural

meaning. They display not only the most consummate powers of observation and skill at finding out the truth about things but also a grand mastery in the use of words to convey clearly what was in his mind to his readers or hearers. As an example of his art, we may quote a short passage from the memorable address he prepared at short notice in reply to the sensational pronouncement made by Koch, at the British Congress on Tuberculosis held in London in 1901, that in the light of the experiments which he reported he (Koch) "should estimate the extent of infection by the milk and flesh of tubercular cattle, and the butter made of their milk, as hardly greater than that of hereditary transmission, and I therefore do not deem it advisable to take any measures against it." Professor M'Fadyean had already indeed uttered warning, at the general meeting of the National Veterinary Association held at Plymouth in 1899, against the dangers of dropping into exaggeration in regard to the risks of human infection from these sources and declared his belief that it was "exceedingly doubtful whether any cases of pulmonary consumption in man, which is the rampant form of tuberculosis in the human subject, ever originated from bovine tuberculosis . . . ." In the face of Koch's statement, however, there was immediate danger of a turn in the popular mind to exaggeration in the opposite sense, and this is how Professor M'Fadyean proceeded to dissect the statement:—

"Opinions varied as to the frequency with which this transmission of tuberculosis from one species to the other occurred, but practically never within the last eighteen years regarding the possibility and probability of such reciprocal infection. What are the grounds upon which we are asked to discard convictions that appeared to rest on such a solid basis? I shall endeavour to state them briefly, as I understand Dr. Koch's train of reasoning:

(1.) The bacilli found in cases of bovine tuberculosis are much more virulent for cattle and other domestic quadrupeds than the bacilli found in cases of human tuberculosis.

(2.) This difference is so marked and so constant that it may be relied upon as a means of distinguishing the bacilli of bovine tuberculosis from those of the human disease, even assuming that the former may occasionally be found as a cause of disease in man.

(3.) If bovine bacilli are capable of causing disease in man, there are abundant opportunities for the transference of the bacilli from the one species to the other, and cases of primary intestinal tuberculosis from the consumption of tuberculous milk ought to be of common occurrence. But *post-mortem* examination of human beings proves that cases of primary intestinal tuberculosis are extremely rare in man, and therefore it must be concluded that the human subject is immune against infection with the bovine bacilli, or is so slightly susceptible that it is not necessary to take any steps to counteract the risk of infection in this way.

Now, with the utmost diffidence I venture to submit that at least one of the premises contained in this argument is not well founded, that the others have little or no bearing on the question, and that there still remain reasonable grounds for regarding tuberculous cows' milk as distinctly dangerous to human beings. . . . ."

He then proceeded to display the evidence in support of his arguments.

As a result of this unsettling of public opinion a Royal Commission on Tuberculosis was appointed at once, of which Professor M'Fadyean was a member and its interim reports, from 1904 onwards, have made the position as we now know it, abundantly clear. Legislation, it may be added here, to deal with the disease in the light of the findings was, however, unaccountably delayed by Government until the introduction of the Tuberculosis Order of 1913, admittedly "a mere reconnaissance to explore the position of the enemy." It was the work done for the above Royal Commission which brought Sir John in 1905 the honour we have mentioned earlier in this appreciation. How far back his experience goes in dealing with the subject of tuberculosis may be gauged from a short acknowledgement he makes at the end of his first article on tuberculin testing of cattle, which tests were carried out while he was still at Edinburgh (*J. Comp. Path. & Therap.*, 1891, **4**, 35), and were the first tests of this kind in this country, of the help he had received from two recently-qualified young men, Mr. S. Stockman and Mr. A. E. Mettam. So also with glanders, we find him carrying out work in collaboration with W. Hunting soon after his arrival in London in 1892 upon the diagnosis of glanders with the aid of mallein and we find acknowledgement given to a recently-qualified assistant, Mr. Hobday, for the help given (*J. Comp. Path. & Therap.*, 1892, **5**, 317). The subject of tuberculosis, however, seems to have long attracted his foremost attention: he had early conceived the possibilities of active immunisation of cattle, and the few experiments which he commenced in 1899 (*J. Comp. Path. and Therap.*, 1901, **14**, 136, and 1902, **15**, 60) while it was "not pretended that they foreshadowed a practicable method of vaccinating cattle on a large scale" established that animals of that species can have a very high degree of immunity conferred on them." In the light of subsequent developments he was probably over-cautious, however, when in communicating these results to the Pathological Society of London he declared that he felt himself in the same position as Cavendish, the great physicist, when he thanked God for having at last found out something which was not likely to turn out useful. All the output of research of which what has been mentioned forms only a small part, was carried out in conditions which most

present-day workers would have deemed discouraging if not completely impossible, for it was not until what would now be regarded as a small sum was placed at his disposal for research out of the newly-constituted Development Fund in 1910 that he had anything more than beggarly facilities. And then we find him return at once to the investigation of vaccination against tuberculosis and diagnosis of this disease. Men like Dr. William Bulloch on the medical side who are familiar with all steps in the advances made in our knowledge upon tuberculosis in the last half-century can be relied upon to form an accurate estimate of the value of the work done on this subject, and so it is therefore small wonder that the first award of the Weber-Parkes Prize and Medal, in 1933, by the Royal College of Physicians "for the best work already done in connection with the aetiology, prevention, pathology, or treatment of tuberculosis in this country or abroad" was made to Sir John M'Fadyean.

We need not dwell here upon the great interest which he took in the study and teaching of what may be classed as tropical diseases (among other things, he discovered the virus of horse-sickness) and the far-reaching influence this has had in the development of veterinary services in our overseas possessions.

So let us hark back to the year 1876 for brief historic treatment. This year heralded the approach of what was to be looked upon as the golden age of veterinary progress, as M. Leclainche, Sir John M'Fadyean's genial and distinguished French contemporary and friend, has so clearly told us in the brilliant, scholarly book on "The History of Veterinary Medicine" which we have just received from him for review. The rapid extension in the use of horses for industrial purposes and for road transport gave the impetus for the growth of the large horse practices in the big towns, of which the Mecca of the aspiring veterinarian was London, and for the consequent strengthening of the body corporate of the qualified veterinarians. Again, the birth of veterinary science in the sense that any part of the equipment of the veterinarian could be looked upon as scientific as distinguished from that of an art was to follow in the train of the discoveries made by Pasteur, Lister and Koch. Great discoveries which changed as it then seemed the whole aspect of medicine as it had been understood from time immemorial came to be announced almost daily. The men who were there ready at the beginning of things experienced thrills which urged them to ever-increasing endeavour. Then towards about the end of the century this great torrent of discovery seemed somehow to dry up, to be followed by some disillusionment and depression because the course of the ordinary work-a-day medicine of the practitioner had not been so vastly changed by these great discoveries after all. Soon again, M. Leclainche reminds us, the revenues of the great town practices were to dwindle with the replacement of the horse by mechanical traction; and he might have added that so far as this country was concerned the compelling urge for adventure abroad was to be stemmed by the establishment of veterinary teaching institutions overseas, particularly in our self-governing possessions.

And so it was into this kind of world that was full of hope though money was scarce that young John M'Fadyean and a number of other remarkable young men embarked on their careers. It has often been held that young men who distinguish themselves for their intelligence during their college careers are not necessarily those who are likely to weather the buffetings of later life. Sir John M'Fadyean himself has never been known to lay claim to having achieved anything more than a mediocre career as a young student. However, the records given in great detail in our periodicals of the Fitzwygram Prize competitions which had then newly been instituted, namely in 1875, give us an astonishingly clear account of his prowess. He did not get the first Prize, but was beaten by a nose, as it were, by a young man who, we are very happy to say, has also lived to be an octogenarian, and has laid us in the "National" under a lasting debt of gratitude to him, namely, George Amos Banham, of Cambridge, the two of them finishing a long way in front of the rest of the field, with Fred Smith coming down the first time round after a promising start, over the stiffest course of obstacles one can imagine, the marvel being that young men could take them after two short sessions of training, the judge at the winning-post being (if we may again extend the metaphor) no other than the great physiologist Burdon Sanderson. The preceding year, the year of the first award, the Prize was won by J. H. Steel, who died young, in Bombay, in 1891, at the age of 39, and after whom in recognition of his work and character the most coveted Medal to be won "as a reward for scientific or literary work of merit connected with the profession" is named "to perpetuate the memory of an earnest worker, so that his example may incite others, and to benefit the profession by encouraging and rewarding merit." It is opportune here to record that it was these two boys, J. H. Steel and G. A. Banham, as we would now be inclined to call them, who, in the year 1881, by their energy and determination, under the wing of George Fleming, set the foundations of the "National." Steel was then Demonstrator of Anatomy at the Royal Veterinary College, London, and Banham, an assistant at the Brown Institution. Steel meanwhile had been active in writing books on

the diseases of cattle, sheep and dogs, about which the amount of collected information at that time within the reach of veterinary students was very scanty. We find that by the year 1883, that is, by the time when the first Annual General Meeting of the properly constituted "National" was held, Banham had elected to chance his career in private practice and settled at Cambridge. His name will be generally familiar to students and practitioners by reason of the useful little handbook entitled Veterinary Posology. We see in the lists of graduates at about this time the names of several men that have since become very familiar to us, like Albert Wheatley and Charles Sheather, in the large veterinary practices. We find, however, that John M'Fadyean of his own choice selected a different turn for his career. He was already older than most veterinary students when he started College, and was prepared to submit himself to a long period of stern self-discipline to comply with the plans he had made for himself for his proper training, while maintaining himself on the emoluments of the kind of post, as teacher of anatomy, for which we learn from the rejoinder of the bitter victim of his outspoken criticism some years later, the occupants selected though styled professors, were always youthful and generally "premature" in giving vent to their opinions because their most essential qualification was that they should be able to subsist on a meagre dietary. And so, for six years after graduation as veterinarian this young man remained as the above victim also exclaimed "unheard of," and concurrently with the teaching of anatomy at the Dick College put himself through the very arduous task of following the courses at the Faculties of Medicine and Science at the University of Edinburgh, to improve his equipment as a teacher. During this time he came particularly under the influence of the great anatomy teacher, Sir William Turner, at the University. To provide veterinary students with a dissection guide for their use comparable to what was in the hands of medical students he wrote what has long remained the most familiar handbook of the veterinary student, "The Anatomy of the Horse," the first edition of which appeared in 1884. The other familiar handbook, of "Class A" students, "The Comparative Anatomy of the Domesticated Animals. Part I. Osteology and Arthrology," appeared later, in 1887. It is interesting to read the comments of an anatomist reviewer (1888) on this little book when it first appeared, as indicating something new in the literature on veterinary anatomy and characterising what we were to see and hear so frequently from the author in later years: "It must have cost the author dear in the matter of hard work. The text is entirely new and fresh, and there is not a trace of 'cabinet' anatomy from the first page to the last. It has been written down on paper from the very bones themselves. The illustrations are all new, *and fit each other and the text.* . . . There is no confusion here. . . . Everything is shown with pencil that is written of with the pen. . . ." The second part promised by the publishers never appeared, for meanwhile the author's chief interest had been transferred to pathology, in which he had commenced classes at the Dick College, and then in 1888, he launched "The Journal of Comparative Pathology and Therapeutics," at the age of 33. The first number of this publication appeared, again characteristically, without an announced programme, and without pretension, and this enterprise must have "cost him dear" in what might otherwise have been his leisure hours every year since then. The designation of what we now prefer to call simply veterinary science by the name comparative pathology must have been very much in the air at that period, following perhaps upon the teachings that were then new of Virchow and others upon cellular pathology, for we find that Fleming had also launched, in 1875, "The Veterinary Journal" with the sub-title, "Annals of Comparative Pathology" a title under which it continued to appear for many years under his editorship. During his stay as teacher on the staff of the Dick College upon the subject of anatomy, which covered in all 16 years, it is therefore noteworthy that the end of John M'Fadyean's long self-imposed period of scholastic probation almost exactly coincided with the date of the publication of Koch's great discovery of the tubercle bacillus, in 1882, and so he was ready equipped to take advantage of the opportunities that were to fall his way, and how well he seized these opportunities may be assessed when we learn that the invitation extended to him to join the staff of the London College in 1892 was on the strength of the great reputation he had already made in virtue of his work upon tuberculosis and of his capacity as a teacher. As is the way with text-books, usually publications of this kind eventually lose even antiquarian interest, but we believe that in time to come the student of this period will find endless interest in probing into the manner in which the researchers who were there at the beginning of things in veterinary science looked at their task and set about to solve it. This is our reason therefore for continuing this narrative, and reproducing some passages from an inaugural address delivered by John M'Fadyean, at the Dick College, 54 years ago, that is, when he had reached the age of 29 years, and was at the threshold of his great career (*Veterinarian*, 1882, **55**, 833; *Vet. J.*, 1882, **15**, 433):—

We are met here to-day (November 1st, 1882), to inaugurate the sixtieth session of

the Edinburgh College. On November 24th, 1823, the introductory lecture of the first session was delivered by Professor Dick in the Calton Convening Rooms, and the history of veterinary science in this country may be said to date from that occasion. It is true that previous to that time there existed throughout the country a set of men variously designated as cow-leeches, farriers, or cow-doctors, who, generally in combination with some other calling, ministered to the ailments of the domestic animals. These men received no particular training for the calling that they followed. They were lamentably ignorant of the diseases that came before them, and their methods of treatment were dictated by a blind empiricism, or by a still blinder superstition.

It need not be doubted that even at that time there existed among stockowners a desire to have their sick animals rationally treated by men specially educated for the purpose, and it became the early ambition of Professor Dick to supply the want. With this object he attended the classes of the medical and surgical schools of Edinburgh, and in the years 1817-18 he studied at the London Veterinary College, obtaining in the latter year the certificate which that school was in the habit of granting to its pupils. On his return to Edinburgh he engaged in the practice of his profession, and began to give short courses of lectures on veterinary subjects. In the spring of 1823 he was fortunate enough to have his efforts brought under the notice of the Highland and Agricultural Society by Mr. Johnson, a merchant of this city. A committee was forthwith appointed to promote veterinary education, and in the same year Professor Dick's school was formally opened under the auspices of the Society. The entire course consisted of forty-six lectures. The number of students was twenty-five, and each of them paid the moderate fee of two guineas.

On an occasion like this one might be pardoned for dwelling at length on the development of veterinary education and on the consequent rise of the profession during the last half century. At the present time, however, there is perhaps a dangerous proneness to estimate our position by looking back along the way we have come rather than by looking forward in the direction in which we ought to advance. Indeed, in many quarters there is not only a tendency to magnify the progress that our profession has made, but there is even a serious misconception as to wherein true progress consists. Constant complaint is heard of that as a profession we are not accorded that place in the public estimation to which we are justly entitled, and many talk as if our position could be made better by Acts of Parliament and things of that nature. The complaint is probably unfounded. It must be confessed that we are yet far from occupying that position in the public regard that it is our ambition to attain to, but it will be wholesome for us to accept the public estimate as the just one, and to set ourselves to find out how our claims to a higher position may be enhanced.

Our title to a higher place must rest on an increased knowledge of the diseases affecting the domestic animals, and on an increased power to cure or to prevent these diseases. And if we accept that as a definition of genuine progress we must humbly confess that though our march may have been steady it has been very slow. We cannot institute a comparison between the veterinary literature of to-day and that of the beginning of the century, because at the latter date there did not exist any literature worthy of the name. But even yet veterinary literature is scanty, and what there is of it is not wholly divested of superstition. Will it be believed that there is hardly an important disease peculiar to domestic animals the pathology of which is fully and accurately known? Such, however, is the case, and most of the exceptions are diseases where our knowledge has been increased by investigators outside our own profession. It is true that for most of the diseases there has been framed some sort of a pathology, which, however, is at the best merely provisional, and to be retained only till minute investigation and extended observation shall have furnished us with the evidence necessary for trustworthy conclusions. It is along this line of uninvestigated diseases that our forces are to be marshalled and the battle fought. That but little of this work has yet been done is because the individual members of our profession have not had that scientific training which is necessary to fit them for the task; and progress will be made possible only by the proper education of the veterinary student. It is the character of the units of the profession that determines the character of the profession as a body. The average veterinary practitioner at any particular period reflects the state of veterinary education at the time when he graduated. The quality and extent of the teaching afforded by the schools is thus of paramount importance, and whatever progress we have made, and are still making as a profession, may be traced to the development of veterinary education.

When Professor Dick first began his class, veterinary medicine and surgery existed as an *art*, but it could hardly be said to have a place as a *science*, and so doubtless it was with the teaching. The prescribed period of study was hardly sufficient to teach what was to be done and how to do it. There was no time while instructing students in the *art* to teach them the equally important *science* which explains the principles on which the *art* depends.

We can now rapidly bridge the years which are touched upon by what we have tried to say about his own subsequent achievements, and come to the time when he had reached the zenith of his career, and ask ourselves again whether there were any set rules which he observed in carrying out his undertakings. Knowing the man, we can close by saying that these rules are accurately reflected in a passage of advice contained in an inaugural address (October 1st, 1913) (*Vet. Rec.*, 1913, **26**, 224) he delivered to his students at the London College 41 years later. We feel that it was so rare for him to give utterance to any advice that might touch his students' personal interests or inclinations that the passage merits reproduction:

"It is a time-honoured custom in these inaugural addresses to proffer advice for the guidance of students during their college life, and I feel I must conform to it, though I cannot forget that General Smith last year expressed a doubt whether more than one student a year had been influenced by the wisdom annually poured forth in this class-room on the first day of the session.

It is no exaggeration to say that you are now entering on the most important and most critical period of your lives. Hitherto your conduct and mode of life generally have been under more or less close supervision and control. Your life

here will involve a considerable degree of emancipation, and you will be freer than you were before to choose between your inclinations and what your knowledge or your conscience tells you to be your duties. New temptations will appear and old ones will continue to assail you. It will now be easier to succumb to these temptations or to neglect acknowledged duties without being immediately found out, or without immediate serious consequences to yourself. Most momentous issues for you depend upon the manner in which you regulate your life during the next few years. If you succumb to certain temptations your bodily health may be permanently ruined, and if you begin to neglect what you know to be duties your success in life afterwards may be made difficult or impossible. The important fact to remember in this connection is that the will power is sapped by yielding to temptation and strengthened by resisting it, and that the habits which you establish during the next few years are likely to be permanent.

I prefer to speak in quite general terms on this matter, and not to specify the temptation against which you will have to be particularly on your guard. I think it important, however, to warn you to be very careful in forming your friendships, and to avoid intimacy with any one whom you know either to be vicious or indolent.

With regard to the carrying out of your studies here little need be said. The best advice which I am able to give you in that connection is to do all your work systematically. Give to each subject that proportion of your time which you find to be necessary for reasonable progress, and firmly resist any inclination to work intermittently or by fits and starts. Remember that each term is only ten weeks, and that each week has its own amount of new matter to be assimilated. A week of idleness may therefore disorganise a whole term's work, and entail disaster in your next examination. The programme of work in each year is quite heavy enough to tax the resources of a student of good ability, and there is not the least chance of anyone passing any of the examinations without a reasonably good knowledge of the subject. This does not mean that it is desirable or necessary for anyone to pursue his studies with an intensity likely to interfere with his bodily health. On the contrary, students, and especially those who come here for the first time, must be advised not to neglect systematic bodily exercise in some form or other, and to give their minds a complete rest from study at the end of each week.

I remember that the author of a previous inaugural address delivered in this room urged the students to be ambitious, and I would like to repeat the advice. And I shall be glad if each of you will consider what I am now going to say in conclusion as addressed to you personally, just as if I had mentioned your name.

When you pass you will become one of a band of some three or four thousand persons to whom the State has granted certain special privileges. The principal one of these is the right to call yourself a veterinary surgeon. Let it be one of the chief ambitions of your life to make that designation stand for something higher in the estimation of your fellow citizens.

With that object you must in the first place spare no effort to make yourself master of what is already known regarding the science and practice of your profession. Your efforts in this direction must begin now, and be continued throughout the whole of your professional life. Secondly, you should endeavour to add to the sum of existing veterinary knowledge, so that when your labours are finished your professional brethren may be able to say, "He left our inheritance richer than he found it." Lastly, but not least, let your conduct be that of a gentleman in the best sense of that word.

Abstracts

[Experiments on Anthrax Vaccination. (Trans. title.) Ramon, G., and Staub, A. (1935.) *C. R. Soc. Biol., Paris.* **119.** 1073-1076. (10 refs.)]

Experiments carried out ten years ago by G. Ramon, E. Lemétayer and B. Richou showed that the incorporation of diphtheria or tetanus toxoid in an excipient such as lanolin considerably improved the immunising properties of these toxoids. For example, the addition of lanolin to each of the two doses of tetanus toxoid used for immunising against tetanus resulted in an immunity, stated by the authors to be thousands of times stronger than that set up by tetanus toxoid alone. This practice has since been extended to living organisms, particularly *C. diphtheriae*.

In this publication the authors describe experiments dealing with the comparative value of this method in the application of Pasteur's vaccine in anthrax prophylaxis.

As a result of successful preliminary tests on rabbits the following experiment was conducted on five groups of sheep, each group consisting of three animals. Group I was vaccinated according to Pasteur's method (½ c.c. of first and second vaccine subcutaneously in the thigh with an interval of ten days); Group II according to Besredka's method (a single intradermal injection of Pasteur's second vaccine into the tail); the third group received a subcutaneous injection of saponin vaccine according to the formula and method of Mazzuchi; the fourth group was vaccinated with a single subcutaneous injection of 1 c.c. of first vaccine *plus* alum (0·3 c.c. of a suspension of spores in 20 c.cs. of a 3 per cent. solution of alum), and the fifth group with a single subcutaneous injection of the first vaccine in lanolin. This consisted of spore suspension 0·3 c.c., lanolin, 5, oil 15 (presumably c.c.).

Local and general reactions were hardly appreciable in Groups I and II, but were more marked in the other groups. The sheep treated with the vaccine in lanolin displayed a rise in temperature 36 hours or later after vaccination. At the site of injection there was no appreciable change during the first two days, the lanolin and vaccine having been apparently absorbed, but from the third day an oedematous area developed which became gradually transformed into a nodule the size of a hazelnut or walnut. These nodules, which involved the connective and adjacent tissues more than the skin, gradu-

ally regressed and finally disappeared, leaving no trace.

After an interval of from five to six weeks all the vaccinated animals were tested with a dose of virulent culture which killed control sheep in 48 hours. The sheep vaccinated by Pasteur's method resisted infection. Those vaccinated by means of a single intradermal dose had a severe general reaction but did not die. Of the three sheep which received saponin vaccine, one died but the others, which also showed a marked rise in temperature, survived. Those vaccinated with the alum vaccine and vaccine in lanolin only revealed a temporary rise in temperature. Two other sheep which had been injected subcutaneously with a saline suspension of the first vaccine without any addition died within the same time as the controls.

In another experiment, six sheep were vaccinated under the same conditions as those just described, two with saponin vaccine, two with alum vaccine and two with lanolin vaccine. Tested five months later one of the sheep vaccinated with saponin vaccine died, the others resisted the test dose.

Up to the time of publication, 25 sheep had been vaccinated with the aforementioned lanolin vaccine and all had withstood a particularly severe test dose.

The authors thus conclude that it is possible to confer on sheep a solid and durable immunity against anthrax by a single dose of Pasteur's first vaccine, incorporated in lanolin.

G. D.

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[Contagious Bovine Abortion: A new Treatment. (Trans. title.) Moussu, R. (1935.) *Rec. Méd. vét.* **111.** 12. 905-919.]

A claim is made for a method of prevention of contagious abortion, based on the author's hypothesis that a deficiency of vitamin E and not *Brucella abortus* is the primary cause of the disease. He endeavours to support this contention by pointing out that, although infection with *Br. abortus* is fairly common in horses, abortion in the mare due to this organism is rare, due to the amount of grain (containing vitamin E) in the ration. For the same reason, bulls rarely become infected.

The treatment consists of a course of vitamin E. The first method tried was the feeding of wheat germ, but this allowed of no real control, and was replaced by the subcutaneous inoculation of wheat germ oil. Three injections, each of 30 to 40 c.c., are given, one at the time of service, the second after three months, and the third after six months of pregnancy. It was found that a dose suitable for one district was insufficient in another.

Since 1931, 7,000 cows have been treated in all parts of France with "regular success and above all the disappearance of abortion."

No details are given of any true experimental evidence, or of any control animals.

A. W. T.

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[Some Fallacies in the Diagnosis of Helminthic Disease. Taylor, E. L. (1935.) *Proc. Roy. Soc. Med.* **28.** 8. 1002-1004.]

[The Appraisement of Hookworm-killing Drugs. Lane, C. (1935.) *Lancet.* **228.** 5834. 1459-1464.]

Taylor points out that quite a false impression may be given by the large numbers of helminth eggs revealed by a flotation technique applied to faeces, unless the diagnostician is aware of the egg-output of the parasite in question. Thus a single female *Ascaris lumbricoides* may lay 200,000 eggs daily. Even taking this into account there remain several sources of error which make it almost impossible to assess the numbers of worms present from counts of the eggs passed: eggs are diluted by faeces to a variable extent, the egg-output varies considerably from day to day under normal conditions and is adversely affected by anthelmintics and by a state of resistance in the host. The discovery of large numbers of helminths on *post-mortem* examination may also be misleading, since the host may tolerate enormous numbers of one species without apparent harm, and yet be adversely affected by small numbers of a different species. The veterinary diagnostician should be concerned with disease, and not merely with parasitism.

Clayton Lane uses some of the same arguments to show the futility of estimating the efficacy of anthelmintics (against hookworm in man) on the basis of egg-counts. Efficacy can better be estimated from the relative number of positives before and after treatment: "evidence for complete deworming is the only stable criterion of drug efficiency." Thus the flotation technique should be used only qualitatively, to establish presence or absence of infection. In man, the first criterion is that the drug selected should be safe, since hookworm rarely kills directly. In this respect thymol has an advantage over newer drugs.

B. G. P.

(Contributed by the Imperial Bureau of Agricultural Parasitology.)

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[Diagnosis of Fasciola hepatica and Amphistomum cervi Infections by Allergic Reactions. (Trans. title.) Curasson, G. (1935.) *Bull. Acad. vét. Fr.* **8.** 1. 77-81.]

Curasson has examined the specificity of the cutaneous and intradermal reactions in infestations with amphistomes and liver fluke in sheep and cattle. His experiments seem to show that the reactions are of little value in the diagnosis of these diseases as positive results have been obtained from animals carrying no parasites and negative results have occurred in known

carriers. He discusses the possibility of these reactions being caused by haemoglobin or by the lipoids of the parasites.

P. A. C.

(Contributed by the Imperial Bureau of Agricultural Parasitology.)

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[**The Nutrition and Pathogenesis of Oesophagostomes.** (Trans. title.) Wetzel, R. (1934.) *Deuts. tierärztl. Wschr.* **42.** 37. 602-603.]

Wetzel has studied macroscopically and microscopically—by serial sections—the pathogenic action of Oesophagostome parasites of pig and sheep and the nature of their food.

The adult worms lie in a viscous slime covering the mucous membrane. The latter has the appearance of a chronic catarrhal inflammation with cell infiltration. The subglandular tissues are slightly enlarged and there is some degeneration of the intestinal glands. These conditions are probably brought about by the action of the secretions poured out by the cephalic glands of the parasites. The latter do not ingest the mucous membrane itself but feed on the slimy products of the inflammatory reactions covering it, in which their heads are embedded.

T. G.

(Contributed by the Imperial Bureau of Agricultural Parasitology.)

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[**Syngamus trachea. The Longevity of the Infective Larvae in the Earthworm.** Taylor, E. L. (1935.) *J. Comp. Path. & Therap.* **48.** 2. 149-156.]

Taylor shows that gapeworm larvae can remain viable and infective in earthworms for three-and-a-half years. Certain snails and slugs are also capable of conveying the larvae, which may distribute themselves anywhere in the tissues but which have, however, a predilection for the cerebral nerve ganglia. These intermediate hosts act not only as vectors but also as efficient storing agents of the infective larvae. He was unsuccessful in his attempts to transmit the gapeworm by means of flies or by a variety of common field invertebrates. That the gapeworm has affinities with the Metastrongylidae is suggested, according to this author, by the facts of the use of an intermediate host, the situation of the adult worms in the respiratory system and by the structure of the bursa in the male.

P. A. C.

(Contributed by the Imperial Bureau of Agricultural Parasitology.)

A memorandum on the Nutritive Value of Milk has recently been issued by the Ministries of Health in Great Britain. It was prepared by the Advisory Committee on Nutrition and is an important contribution to a subject of great public interest. The memorandum is obtainable, price 3d. net, from His Majesty's Stationery Office or through any bookseller.

Report

MEDICAL RESEARCH COUNCIL

REPORT FOR THE YEAR 1934-35*

There must be few who fail to be impressed by the ever-increasing activities of the "M.R.C." and its various committees. The present report contains a very impressive record of the exceedingly divergent and extensive ramifications of the research work which is supported, and in many cases, made possible by the Council. A sum of £165,000 has been administered during the year, of which £97,000 has been expended in research grants and expenses of research carried out at the Universities and other centres in the United Kingdom, the remainder being absorbed by the work at the National Institute at Hampstead, administration, etc.

The research carried out covers a very wide field, and comprises a big variety of subjects; certain of these are singled out for special notice, and it may be interesting and instructive to consider here some which are common to man and animals.

I. Nutrition: The Application of Modern Knowledge

The Council has obtained clear evidence that the incorporation of newer knowledge of the principles of nutrition into everyday life is beginning to take place, and that there is more hope now that proper feeding will take its place in advancing human welfare. Milk for school children, "the marriage of health to agriculture," the public consciousness of the importance of vitamins, and so on, are indications of the awakening interest that is being shown. The report stresses once again a fundamental truth, which cannot be stressed too often: "It is necessary to apply the new teachings of nutrition to the pregnant and lactating mother, so that the sustenance she supplies to the developing offspring shall be the best possible. . . . Breast feeding is of even higher value than has been previously believed, and ought to be more extensively adopted and continued for longer periods." The truths of this section can be applied as principles of prime importance to man's domesticated animals no less than to man himself.

Under this section mention is also made of the standardisation of vitamins A, B_1, C and D, which can now be expressed in international standard units, intelligible throughout the world. For details, the report and various published papers should be consulted.

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*H.M. Stationery Office, London, 1936, price 3s. net.

II. Ergot in Parturition—Ergometrine, the Active Principle

Ergot has been a subject of active study for more than 60 years, and yet it was only in 1935 that the discovery of ergometrine was announced. This is looked upon as the chief oxytocic principle, and it has now been isolated and purified. This is a remarkable achievement when one remembers the complexity of ergot and that such alkaloids as ergotinine, ergotoxine, ergotamine, ergotaminine, sensibamine, ergoclavine and acetylcholine have been isolated in the search for that particular principle which is so active on the uterus. Some of these substances (*e.g.*, acetylcholine) have proved to be of immense importance in other fields of physiological and pharmaceutical activity. The identification of ergometrine was only reached through the collaboration of the clinical worker and the co-operation of human subjects under clinical conditions. A quotation here is relevant and worthy of repetition: "These researches, while illustrating how results of equal or even greater importance may be attained by the laboratory as by-products of the chase, also illustrate in no uncertain way how vital to the solution of a problem, originating in and concerning clinical practice, may be the guidance provided by continued investigation upon the clinical material itself." One cannot but wonder sometimes how much a lack of similar clinical co-operation restricts work in the fields of veterinary research.

III. Pernicious Anaemia

Though a pernicious anaemia such as affects man is not recognised in animals, the discovery of a method for preparing the active haemopoietic agent from liver is of interest and may be of practical importance. The agent is described as being not a comparatively simple chemical body, but probably a complex protein structure, comparable to insulin. Injections of 0·1 to 0·2 gramme once weekly restore grossly affected persons to health in a few weeks, whereas even as recently as ten years ago diagnosis of pernicious anaemia was almost equivalent to a death sentence.

IV. Puerperal Fever and Haemolytic Streptococci

If further evidence was required of the importance of the modern concept of the grouping of streptococci in disease, the work done on human puerperal fever would supply it. The research in progress on human puerperal fever, together with that on other diseases, including scarlet fever, tonsillitis, "hospital sepsis," bovine mastitis and equine strangles, in all of which haemolytic streptococci are incriminated, serves to show the very real epidemiological significance of what have hitherto been largely regarded as minor laboratory differences of only academic interest.

V. Standards for Sex-Hormones

Probably no separate section of modern research can show more amazingly rapid progress in the elucidation of its problems, than that concerned with the sex hormones. The average individual is quite unfamiliar with the complexity of the subject and with the progress made. It is very gratifying to note that, as with vitamins, standards for several of the sex hormones have now been agreed upon by the Permanent Standards Committee of the Health Section of the League of Nations. This will prevent further flooding of the market with preparations of unknown strength and potency and those of a semi-bogus nature.

The standard preparations of the oestrogenic hormone are to be called *oestrone*, *oestriol* and *oestradiol*; the hormone from the corpus luteum responsible for changes in the uterus, etc., associated with pregnancy and pseudo-pregnancy, will be known as *progesterone*, while the hormone responsible for the secondary sexual characters of the male will be known as *androsterone*. Accurate standards of these are to replace the older chaotic conditions, and it is to be hoped that practitioners employing trade preparations containing these substances will insist upon a declaration of their strength. In this way their clinical action can be estimated with a degree of scientific accuracy otherwise impossible.

VI. Other Activities

It is impossible to enumerate each of the many other activities of the Council, but from amongst them the following, which have a more particular application to animals, may be noted.

It has been shown that mice can be immunised against psittacosis by injections of virus which has been inactivated by formalin or exposure to light in the presence of methylene blue. Further work has been done on the differentiation of vesicular stomatitis due to a virus, from foot-and-mouth disease. The infective units of the former have a size about eight times larger than those of the latter. Further study has been made of louping-ill, using monkeys as experimental material.

The methods of measurement of the size of the units of viruses, which have been in progress for some years, have been continued and extended. Much information is now accumulating relative to virus diseases and to the various viruses themselves. It is not impossible that artificial cultivation of viruses will before long assume a position not unlike the cultivation of micro-organisms. More than a beginning has already been made using chopped chick-embryo medium.

(*Continued at foot of col.* 1, *page* 508.)

N.V.M.A. COUNCIL: QUARTERLY MEETING

Summary of Proceedings

The volume of business before the spring quarterly meeting of Council, N.V.M.A., held at the Connaught Rooms, Kingsway, on Tuesday, March 31st, and the proceedings of which will be reported upon more fully in our next issue, though large, came more readily within the compass of an afternoon than recently has been the case.

A decision which recently has given rise to correspondence in our columns was embodied in a letter from the Council of the Royal College, conveying the endorsement by Council of the view of the Examination Committee that the present syllabus and examinations for the diploma make adequate provision for veterinary training in the husbandry and diseases of fur-bearing animals and birds. The succeeding item of correspondence yielded warm approbation of the President's action in appointing Captain A. Young (Vice-President for Scotland) to represent the Association on the committee which is to formulate and conduct congratulatory activities connected with the celebration of Dr. Bradley's Silver Jubilee as Principal of the Edinburgh College, and in recognition of his "eminent and far-reaching services, not only to the profession but, through it, to agriculture and public health."

The report on membership of the Association constituted a gratifying indication of the steady numerical expansion of the N.V.M.A., the total now standing at 1,803 as compared with 1,698 in April, 1935.

Membership of the Parliamentary Science Committee is to be continued, and its value to the profession was exemplified by the fact that already a considerable number of questions affecting veterinarians have been asked in the House through the agency of the committee, and prompted by the Association's representatives thereon. Of great potential usefulness is this means of directing governmental attention to our point of view on veterinary public health and allied matters.

Arising from the resolutions on the subject from the Central Veterinary Society requesting the N.V.M.A. to institute a committee, representative of all the Divisions of the Association, to investigate the schemes for the free treatment of the sick animals of poor persons in view of their important bearing on the welfare of the profession, secretaries of the Divisions are to be asked to furnish certain information on schemes in their areas.

It is evident from the report of the Appointments Committee that continuous attention is paid to strict adherence, by members applying for whole-time posts, to the minimum scale of salaries laid down by the N.V.M.A.

In connection with the tuberculin testing to be carried out under the Milk (Special Designations) Order, the Veterinary Officers and Public Health Committee express the view that it should be done by practitioners in collaboration with the whole-time veterinary officers, where such exist.

It is satisfactory to know that the Parliamentary Committee are pressing on the Government Committee on the Consolidation of Local Government and Public Health Enactments the importance of bearing in mind the recommendations made by the Association in 1931, urging the amendment of Clauses 116-119 of the Public Health Act, 1875, so as to invest veterinary officers with powers equal to those possessed by medical officers in regard to the inspection and examination of meat.

It was agreed that the Association should continue to co-operate with the R.C.V.S. in any further steps that it may be decided to take with a view to securing for veterinary surgeons the same position under the Dangerous Drugs Act and Regulations as is occupied by medical men. We are glad to note that it is proposed that representations should be made to the Home Office that when a vacancy on the Poisons Board occurs it should be filled by a member of the veterinary profession.

The Council endorsed the proposal of the Finance Committee that the N.V.M.A. scheme for carrying into effect the recommendations of the Economic Advisory Council's Committee on Cattle Diseases should be reprinted and circulated to members of the Association in the form of a supplement to this journal. Other

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In bacteriological fields much interesting progress has been made. Most of this relates to purely human diseases, but the further investigation of the specific accessory factor for certain types of bacterial growth reported earlier, has been continued, and is likely to prove of fundamental importance to bacteriologists generally. Further progress has been made with the preparation of "johnin" for diagnostic purposes and methods for cultivating the organism of a disease of sheep simulating Johne's disease in cattle have been successful. The name "paratuberculosis" has been suggested for this disease.

There is much more in the report of intense interest to veterinarians which does not lend itself readily to a review. It can be heartily recommended to everyone who wishes to keep himself abreast of modern medical discovery.

W. C. M.

(approved) recommendations of interest from this committee were that no extension should be made of the present basis of Honorary Membership and that there should be no reduction of subscription in the case of members in partnership.

In regard to the question as to how far grunting in horses, when unaccompanied by whistling or roaring, constitutes an unsoundness, this committee for very "general purposes" reported that it did not support the formation of a special committee to consider the question, inasmuch as it had come to their knowledge that the Agricultural Research Council was devoting funds to an investigation into the diseases of horses and that they understood that grunting was one of the conditions which was to be considered.

Information supplementary to that already published in *The Veterinary Record* in connection with the Annual Congress of the Association to be held at Scarborough in September, was given in a further *interim* report from the Provisional Committee. Of particular interest is the news that Professor Nils Lagerlof, of the Stockholm Veterinary College, will attend to lecture and demonstrate on his latest work in connection with sterility in bulls. No doubt the event will witness a repetition of the success achieved by another of our continental colleagues, Professor Folmer Neilsen, by his demonstration at the Aberdeen Congress of 1924 on an allied subject—the sterility treatment of dairy cows.

With one exception, Council dealt with the numerous resolutions before them from Divisions either by deferring their consideration or by referring them to the appropriate committee. Adoption was, however, accorded a resolution from the Society of Veterinary Practitioners which can only be regarded as a very timely and valuable aid to the promotion of harmonious relationships between those sections of the profession most concerned with the reorganisation of the local government veterinary services; and as an aid, also, to the task and duty of establishing those services—so far as the matter lies with the profession—on a satisfactory and efficient basis. As finally adopted by the Council, this resolution was as follows: "That a letter be sent to the Chief Veterinary Officer in each county council and county borough council having appointed such an officer expressing the willingness of practitioners in that county or county borough to co-operate with, and act under the supervision of, the whole-time veterinary officers in the area." It was further agreed that the foregoing resolution should be sent to all county councils and county borough councils except those employing officers who have accepted appointments banned by the N.V.M.A.

N.V.M.A. Divisional Report

DERBYSHIRE V.M.A.*

MEETING AT SUTTON BONINGTON

A meeting of this division was held at the Midland Agricultural College, Sutton Bonington, on Wednesday, January 22nd, 1936. The President, Mr. L. A. Auchterlonie, occupied the chair and there were also present Messrs. H. Burrow, G. Durrant, G. Eaton, R. S. Cockburn, J. Edwardson, P. M. Evershed, O. V. Gunning, F. A. Davidson, H. L. Torrance, E. Wilkinson and the Hon. Secretary. Messrs. T. P. Briscoe, H. Gordon, G. J. G. Halford, A. Kelly, J. M. McLinden, W. Simpson, and J. T. Turney were present as visitors. Apologies for absence were received from Mr. G. R. Benbow, and Mr. H. W. Steele-Bodger.

On the call of the President and in memory of our late King, those present stood and observed silence.

The minutes of the previous meeting were taken as read and signed as correct subject to the inclusion of the names of Messrs. Edwardson and Sweeney amongst those present.

Nomination of New Members.—Mr. F. A. Davidson nominated Mr. F. A. Gordon, T. P. Briscoe, J. M. McLinden and Mr. J. T. Turney. Mr. H. L. Torrance nominated Mr. A. H. Hunter.

Election of New Members.—Mr. G. R. Benbow, Mr. H. Burrow, and Mr. R. S. Cockburn were elected to membership of the Division. The President welcomed the new members and said he hoped they would become regular attenders at meetings.

Correspondence.—From the Royal Sanitary Institute, inviting the nomination of a delegate to attend the congress of the Institute at Southport in July. It was decided that no delegate be sent.

Presidential Address.—Mr. Auchterlonie said that since the meeting had an excellent paper upon an important subject to discuss, he did not propose to give any address other than to say that he thanked the members for electing him to the chair, and that he would spend his year of office in trying to make it a successful one for the division.

Paper by Mr. H. L. Torrance.—As this paper entit'ed, "Thoughts on the Auscultation of the Bovine Chest," had been circulated to members before the meeting, it was taken as read. Prior to the meeting the members had taken the opportunity of examining by the phonendoscope a cow that Mr. Torrance had arranged to have brought for that purpose. Regarding the history of this animal, Mr. Torrance said that in November, 1934, she was reported as an

*Received for publication March 11th, 1936.

animal coming within the provisions of the Tuberculosis Order, but on making a clinical examination using the phonendoscope and a microscopic examination of sputum, he made a diagnosis of emphysema. Since that time the animal had been examined on the occasion of each routine examination that had been made of the herd and the clinical condition had remained unchanged. Since the time the animal was first seen in 1934 its physical condition had, however, improved distinctly. A good discussion on the paper and the demonstration took place in which the following took part: Messrs. Davidson, Cockburn, Gunning, Durrant, Edwardson, Evershed, Burrow, Eaton, Simpson, and Auchterlonie. Mr. Torrance replied to the various questions raised.

The main points brought out in the discussion were that experience in the use of the phonendoscope was necessary to enable the clinician to assess its true value and to obtain the maximum results from its use, and that further carefully checked observations on its use would add greatly to its value in differential diagnosis. It is almost certain that one result of the paper and discussion will be to stimulate those that were present at the meeting to make further use of the instrument. [Mr. Torrance's paper is reproduced earlier in this issue.—*Editor.*]

Several votes of thanks were accorded, and the company took tea together.

W. J. Ironside, *Hon. Secretary.*

GREY SQUIRREL PEST

After a great reduction a few years ago the number of grey squirrels is increasing with rapidity. "Unless action is taken quickly," states Mr. L. W. Swainson, organising hon. secretary of the National Anti-Grey Squirrel Campaign, in his recently-issued report, "our song birds and orchards are going to suffer as badly as ever." He adds that the period between the end of shooting and the beginning of the breeding season, though short, is obviously the best time for the destruction of grey squirrels. This year, thanks to 26 county councils, more than 5,000 posters have been distributed asking people to "kill the tree rat."

The Birmingham Parks Department says that the pest has virtually been exterminated there; Bournemouth states that its grey squirrels are gradually being reduced, though letters of complaint are still received from that neighbourhood; and the Richmond Park superintendent reports that he is killing the squirrels off at the rate of over 400 a year, the chief trouble being a persistent influx of the vermin from neighbouring places. The latest survey of Mr. A. D. Middleton, at University Museum, Oxford, reveals that grey squirrels are invading new territory both to the East and West. To the West this was to be expected, explains Mr. Swainson, as they have hitherto shown a tendency to work Westwards; now, however, they are reported from Suffolk. No progress has, so far as he is aware, been made towards finding a suitable virus.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

April 20th.—Meeting of the Editorial Committee, N.V.M.A., at 2, Verulam Buildings, Gray's Inn, W.C.1, 4 p.m.

April 21st.—Meeting of the Derbyshire Division, N.V.M.A., at Sutton Bonington, 2.30 p.m.

April 24th.—Meeting of the Royal Counties Division, N.V.M.A., at New Haw, Weybridge, at 2.30 p.m.

May 7th.—Last day for nominations for election to R.C.V.S. Council.

May 21st.—Voting Papers issued, R.C.V.S. Council Election.

May 28th.—R.C.V.S. Council Election Voting Papers due.

June 4th.—R.C.V.S. Annual Meeting and Luncheon in Edinburgh.

June 11th.—D.V.S.M. Examination begins.

June 24th.—R.C.V.S. Committee Meetings.

June 25th.—R.C.V.S. Committee Meetings.

June 26th.—R.C.V.S. Committee and Council Meetings.

June 29th.—R.C.V.S. Membership Examinations begin.

Sept. 14th-18th.—N.V.M.A. Annual Congress, Scarborough.

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PERSONAL

Forthcoming Marriage.—The engagement is announced of Miss Betty Strong, M.R.C.V.S., elder daughter of Mr. and Mrs. P. R. Strong, of Kelsall, Cheshire, and Mr. William Edward Lloyd Beckett, M.R.C.V.S., youngest son of Mr. and Mrs. Frederick Lloyd Beckett, of Sefton Park, Liverpool. Mr. Beckett, who is a veterinary surgeon in Dorset, is a graduate of the Liverpool University Veterinary School, where he first met Miss Strong, who also secured her veterinary diploma at the Liverpool University. Miss Strong hunts with the Cheshire Beagles, and is also a member of the Chester ladies' lacrosse team.

On Leave.—Following is the Colonial Office List of veterinary officers who arrived on leave from the Colonies and Protectorates during March: Mr. J. Carmichael (Uganda); Major W. J. E. Mackenzie (Hong Kong); and Mr. G. E. Rogan (Tanganyika).

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VETERINARY SERVICES IN ESSEX

In a report to the Essex County Council, the Agricultural Committee recalled that a whole-time combined with part-time veterinary service was in operation in the county, but stated that figures from the chief veterinary officer showed that it would be more economical to establish a completely whole-time service. The Committee had, therefore, decided, subject to the concurrence of the Public Health Committee, to appoint five additional assistant veterinary officers. They recommended that the salary of these officers should be £400, rising to £550, with travelling allowance.

The chairman of the Committee, said the appointment of these full-time officers would result in a saving of £2,000 a year, and, without making the slightest reflection on the experience and skill of the part-time officers, he thought the work would be done in a manner more satisfactory to the Council.

The recommendation of the Committee was agreed to.

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LEGAL NOTES

Anthrax Warning.—When cases under the Anthrax Order were heard at Scarborough Police Court recently the Chairman of the Bench asked that publicity should be given as anthrax was dangerous and contagious to human beings as well as animals.

Edward H. Leadley, farmer, of Cloughton, was fined £1 in each of two cases alleging failure to report anthrax and failure to destroy a diseased carcase. Thomas Sedman, 65, butcher of Burniston, was fined similar sums for removing the carcass and cutting it, but summonses against Colonel Brooke Joynson, Master of the Staintondale Hunt, alleging removal of a diseased carcase and failure to prevent other animals having access to it, were dismissed.

It was stated that the cases arose from an outbreak of anthrax on Leadley's farm, and that a portion of a carcase was sent to the Staintondale Hunt kennels.

Witnesses for the prosecution stated that previous cases of anthrax in the district had not been reported in the Press, and Sedman said that he had never seen a case of anthrax before.

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Tracing Animals in Foot-and-Mouth Disease Areas.—A case of considerable importance in relation to the tracing of animals connected with an outbreak of foot-and-mouth disease near Banbury was dealt with at Congleton Borough Police Court recently. The defendants, a dealer and his sister, were convicted of giving false information to the police and of making false entries in their registers, with the object of suppressing the movements of a cow bought at Banbury market and so avoiding necessary precautionary restrictions.

Enquiries by the Cheshire County Police revealed that the cow had been sold under assumed ownership at Crewe market, but it was eventually traced to a farm in Cheshire. The magistrates imposed fines totalling £14 5s. 0d., and ordered defendants to pay the costs amounting to £4 11s. 6d.

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BRACKEN AND THE BLOW FLY

The Secretary of State for Scotland, on the report of a committee, has decided to give grants for the use of bracken cutting machines. "The loss caused by bracken is not solely on account of it spreading in the place of useful herbage," says *The Farmers' Weekly.* "On some farms the beds of bracken become so high that sheep struck by fly disappear, and in all probability they die without being found by the shepherd or his dog. Their remains provide a ready host for the maggot, thus creating an increasing cycle of blow flies with serious loss and worry to the farmer. The spread of bracken is also a serious matter in some parts of England and Wales, and if the Scottish scheme works well there will no doubt be a demand for similar assistance from the Ministry of Agriculture."

THE WARBLE FLY (DRESSING OF CATTLE) ORDER, 1936.

Under the above Order farmers are required to treat all infested cattle either (*a*) by the periodical application of a prescribed dressing or (*b*) by removing all ripe maggots from the backs of cattle by squeezing them out or by other mechanical means.

The method of squeezing out maggots has been recommended for many years both in this country and on the Continent and is very effective for destroying the pest. Extensive operations were carried out in Ireland over periods of five and six years in which this method was exclusively employed but no fatal results were recorded. (Report of Departmental Committee on Warble Fly Pest, Ministry of Agriculture and Fisheries. Published by H.M. Stationery Office, 1926).

An occasional fatality has, however, occurred in some countries following treatment by the squeezing out method. These cases are attributed to a peculiarity in the system of the animal which makes it highly sensitive to the body fluids of the parasites. In the squeezing out process the warble maggots, especially if they are immature, may be crushed and the liberated fluids may in rare cases produce fatal shock.

It appears that the risk involved by adopting this method is extremely small, but the Ministry of Agriculture and Fisheries wishes to point out that stockowners are not compelled to adopt the squeezing out method, as the Order provides for the alternative method of treating cattle with the prescribed dressing. The treatment of cattle with the prescribed dressing does not involve the slight risk which attaches to the squeezing out method and is effective.

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VETERINARY TRAINING IN NEW ZEALAND: THE DOMINION'S NEED

The *Wellington* (New Zealand) *Weekly News* states that the lack of any provision in New Zealand for young men to qualify as veterinary surgeons was emphasised by Mr. L. J. Wild at a meeting of the Senate of the University of New Zealand, when he urged the need for the establishment of a strong veterinary service to deal with stock diseases and to conduct research work.

The following motion, which Mr. Wild proposed, was adopted by the Senate: "That the professorial boards of Canterbury Agricultural College and of Massey Agricultural College be requested to report to the Senate on the need for the training of veterinary surgeons in the Dominion; and on the estimated cost of the establishment and maintenance of a school of veterinary science in association with their respective colleges; and that the general question be referred to Otago University."

Mr. Wild said there was no provision in New Zealand for young men who wished to qualify as veterinary surgeons, and they had to face the expense of an education overseas. Two agricultural colleges now provided fully for all classes of crop husbandry, but the main crop in New Zealand was still grass. The area under other crops in the Dominion was 2,064,547 acres. Grass occupied 31,350,667 acres, of which over 17,000,000 acres was artificially sown. Except for a small export trade in grass seed, all the grass was utilised and turned into marketable form by means of animals.

"It is true that the agricultural college courses provide for instruction in animal husbandry," said Mr. Wild, "but the need is apparent for trained veterinarians, both as general practitioners and as research workers in connection with the stock population of the Dominion."

Mr. Wild added that this stock population was very large in comparison with that of other countries. New Zealand was seventh on the list for all countries of the world with a sheep population of 28,649,038, which was probably the densest per square mile. There were 4,301,128 cattle, 273,906 horses, and 660,393 pigs, the latter increasing rapidly.

The loss of stock in New Zealand was almost beyond belief, and the toll of disease was far greater than was generally known, continued Mr. Wild, for no complete figures were available, as farmers were unwilling to state their losses, as it appeared that these might be taken as evidence of bad management. He detailed various diseases affecting the animal population of the Dominion.

"All this points to the need for a strong veterinary service," said Mr. Wild. "The shortage of trained veterinary surgeons is indicated by the ready absorption of all the qualified men who come to New Zealand; the importation of men by the Government; and the fact that veterinary 'quacks' flourish in various parts of the country."

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THE EVOLUTION OF NATURAL FATS

In a valuable general survey of the above subject contributed to a recent issue of *Nature*, and which we reproduce by permission of authors and editor, Professor T. P. Hilditch and Dr. J. A. Lovern say: "Metabolic processes and products in living organisms are frequently specific, and it is interesting to consider what relation a classification of organisms according to their characteristic chemical products would bear to that based upon morphology. In a number of cases it has already been realised that chemical peculiarities in plants or animals are specific for a number of biologically related organisms and for no other species. The generalisations of Baker and Smith on the types of essential oils produced in different groups of eucalypts are a case in point. Similarly, it has been realised for some time that in the seed-fats of some plant families specific fatty acids are elaborated in quantity (for example, lauric in the Palmæ, myristic in Myristicaceæ, erucic in *Brassica*, etc.); while the recent observations of Heilbron and co-workers on the pigments and sterols of certain algæ disclose similar specific relationships.

"Hitherto sufficient differentiation has not been defined, in any one group of related chemical compounds common to practically all organisms, to permit a comprehensive view of all forms of living matter from the metabolic or chemical standpoint. Of recent years, however, a very wide range of natural fats (triglycerides) has received detailed attention and, although there are still many lacunæ in the available data, it has become increasingly evident that many close parallelisms exist between the kind and proportions of fatty acids combined as triglycerides in living plant or animal organisms, their classification on morphological grounds, and their places in the evolutionary scale of development.

"Of all the constituents of living organisms, the fats (triglycerides) are exceptionally suited to such comparisons because they contain in combination a number, often a considerable number, of individual acids which can be both qualitatively and, at least approximately, quantitatively determined. There is also considerable variation in the particular acids present, or in their proportions, in organisms of different types. These acids may be saturated (lauric, palmitic, stearic, etc.) or unsaturated (oleic, linoleic, erucic, etc.), and in the latter group the unsaturation may be restricted to one ethylenic union or may extend to as many as four, five or six. Taking the theory of evolution as a general background (as in biological correlations based upon morphology or anatomy), some interesting relationships become apparent when we review progressive differences in fat types. From this point of view we commence with the fats of aquatic life, in the light of recent studies at the Torry Research Station.

"All fats of aquatic origin are characterised by the presence in combination with glycerol of an exceptional variety of acids, mainly of the unsaturated series. The saturated acids usually form only 15-20 per cent of the whole, and of these palmitic acid, $C_{16}H_{32}O_2$, is the chief, the others (myristic and stearic) often only amounting to about 2-4 per cent. and 1-2 per cent. respectively of the total fatty acids. The unsaturated acids include, on the other hand, members containing 16, 18, 20, 22, and even 24, carbon atoms in the molecule (conveniently referred to as glycerides of unsaturated C_{16}–, C_{18}–, C_{20}–, C_{22}–, C_{24}– acids) in varying proportions and degrees of unsaturation. In fats from all freshwater life, plant or animal, small or large, the type appears to be much the same, namely, that containing relatively high proportions of unsaturated acids of the C_{18}– and C_{16}– series, with low contents of those of the C_{20}– and C_{22}– series (the latter often being minimal). Again, both freshwater and marine algæ of the Chlorophyceæ have the same type of fat, and it appears that here both for fat type and morphology salinity has made no real difference. In the more specialised brown and red marine algæ the fat type is definitely altered, the component acids still being aquatic in range but with quantitative differences in the relative proportions of the various homologous unsaturated members. The diatoms resemble the green algæ alike in that many species can live in either fresh or salt water and that their fat is of the 'freshwater' type in all instances so far studied.

"We pass on to a more general survey of aquatic animal fats. Throughout the whole animal life of fresh water we find one broad type of fat only—that already referred to as characteristic of freshwater flora. In other words, for the whole of freshwater life the relative proportions of the component acids are of the same order throughout (at the same time minor differences are to be observed, for example, higher degrees of unsaturation in the acids, and concurrent presence of small proportions of higher alcohols as well as glycerol, in the plankton Crustacea in contrast to fishes, etc.). In the marine world, on the other hand, salinity or some other factor has led to a definite alteration in fat type. While, as has been said, marine diatom fat (so far as at present studied) is similar to the 'freshwater' type, the fat of marine plankton Crustacea (which feed on the diatoms) is considerably different in composition —unsaturated C_{16}– and C_{18}– acids are reduced in amount and C_{20}–, and especially C_{22}–, acids are correspondingly increased. This crustacean fat type persists as a general background throughout almost the whole range of marine fish and mammalia, although it may again be modified

in certain families in various ways. In elasmobranch fish, for example, the triglycerides are often accompanied by abnormal proportions of non-fatty compounds, including especially the hydrocarbon squalene and sometimes the glycerol ether-esters known as batyl, etc., alcohols; when these substances are also produced in quantity it has invariably been found that the unsaturation of the acids in the triglycerides is almost wholly monoethenoid.

"Similar specific features include the elaboration of esters of higher alcohols as well as triglycerides in depot fats of the Physeteridæ (here, again, the unsaturation of the acids present is abnormally low), and that of mixed glycerides of the quite exceptional isovaleric acid in those of the Delphinidæ; such differences are as definitely characteristic as those in the anatomical features of the respective groups. Other interesting marine animal fats include those of the sturgeon, which are of the freshwater type; while salmon body fats alter progressively as the fish develop from purely freshwater to marine animals.

"As we pass from depot fats of aquatic to those of land animals we find marked simplification in the mixed fatty acids, and in the higher land animals the important component acids are almost always the (monoethenoid) oleic, $C_{18}H_{34}O_2$, and the (saturated) palmitic, $C_{16}H_{32}O_2$, the latter occurring in much larger proportions than in aquatic animal fats, namely, about 25-30 per cent. of the total fatty acids—a figure which is roughly the same for the depot fats of widely different animals such as the rat, rabbit, pig, sheep, ox, reindeer, horse, and also, apparently, birds. Nevertheless, the disappearance of the characteristic 'aquatic' unsaturated acids of the C_{16}– (mainly monoethenoid, palmitoleic), C_{18}–, C_{20}– and C_{22}– (mono- and poly-ethenoid) series is by no means abrupt. Klenk has established the interesting fact that, in depot fats of amphibians and reptiles, unsaturated C_{16}–, C_{18}– and C_{22}– acids are present, but in less amount than in fish depot fats: frog depot fat contained 15 per cent. of palmitoleic and the same amount of unsaturated C_{20-22}– acids, that of the lizard, 10 per cent. of the C_{16}–, and 5 per cent. of the C_{20-22}– acids, while in the depot fat of the Greek tortoise the respective proportions were 9 and 7 per cent. The unsaturation of the C_{20-22}– acids, though still high, was not so pronounced as in the fish oils. In these fats the proportion of saturated acids was not very different from that in 'aquatic' fats, and the drop in unsaturated C_{16}–, C_{20}– and C_{22}– acids is balanced chiefly by increase in unsaturated C_{18}– (mainly oleic) acid. Work at Liverpool had previously shown the presence of small quantities (6 to 8 per cent.) of palmitoleic acid in the depot fats of rats and of the domestic fowl, together with minor amounts (0·5–1 per cent.) of unsaturated C_{20}– and C_{22}– acids. The latter acids were already known, from the work of J. B. Brown and his colleagues, to be present in very small proportions in other animal depot fats (for example, pig) and in cow milk fat. In rats, rabbits and hens, in contrast to the frog, lizard, and tortoise, the saturated acids of the depot fats form 30-35 per cent. of the total acids (palmitic, 25-28 per cent.).

Klenk has considered the connection between body temperature and the amounts and degree of unsaturation of the C_{20}– and C_{22}– acids; we would point out here the progressive changes in depot fat component acids in conjunction with the position of the animals in the evolutionary scale. Perhaps the data we have quoted will be more clear if we tabulate the general range of values so far observed for the main component acids in some of the different groups of the larger animals:

Component Acids (Percentage Wt.) in Depot Fat

	Saturated Palmitic	Unsaturated			
		C_{16}– (Palmitoleic)	C_{18}–	C_{20}–	C_{22}–
Fish, freshwater	13–15	*c.* 20	40–45	*c.* 12	0–5
,, marine	12–15	15–18	27–30	20–25	8–12
Whales	12–15	15–18	35–40	15–20	5–10
Frog	11	15	52	15	
To tise	14	9	65	7	
Lizard	18	10	56	5	
Domestic fowl	25–26	6–7	ca. 60	0·5–1	
Rat	24–28	7–8	ca. 60	0·3–0·5	
Pig	25–29	absent	50–65	0·3–1	
Ox	27–30	absent	40–50	absent (?)	

"Almost all the acids other than palmitic (that is, about 70 per cent. of the component fatty acids) in the depot fats of the land animals belong to the C_{18} series. In many cases, apparently (detailed analyses are, curiously, still somewhat scanty in this group except for a few common animals), these acids are largely unsaturated (oleic, with sometimes polyethenoid acids); but in the Ungulata, at all events, stearic glycerides occur, often to a marked degree, in place of oleic glycerides; and specific characteristics in the constitution of the mixed triglycerides in these depot fats, which place them apart from most other natural fats, suggest that the stearic compounds are the result of hydrogenation of oleic derivatives. The milk fats of this group, which are, of course, also differentiated by the presence of a certain quantity of lower saturated acids (C_4 to C_{10}), share with the depot fats this particular type of glyceride structure; this feature has been the subject of many studies in our Liverpool laboratory. In contrast to elaboration of specific lower saturated acids in the milk fat of the larger land mammals, we may note in passing the observation of Schmidt-Nielsen and Frog that the component acids of whale milk fat are almost quantitatively the same as those of its depot (blubber) fat.

"In the depot fats of the land animals, there occurs frequently (usually in not very large amounts) the linoleic acid, $C_{18}H_{32}O_2$, which is a component of many seed fats; but there is much reason for thinking that this is derived by assimilation from the latter. At this point it should perhaps also be said that the data quoted above refer to animals which have received their natural diet; it is well known, of course, that higher animals, at all events, are able to ingest fats from vegetable seeds, etc., and to lay down some of the specific acids of the latter in their depot fats, but this aspect of fat deposition has been excluded, so far as possible, in the observations on which this survey is based.

"The parallelisms to be observed between fat types and evolution in the animal world, as outlined above, appear to possess a certain significance. It remains now to consider the corresponding sequence in the vegetable kingdom. Here, as in the fauna, the data are most abundant for depot (seed) fats of the more developed land plants; there is at present a great lack of detailed information on the characteristic fats of the lower forms of land flora and also on the glycerides present in the growing parts of the larger plants. Nevertheless, it is interesting that the unsaturated palmitoleic (C_{16}–) acid, so characteristic of aquatic and lower land animal life, has been observed in quantity in the fats of a bacillus (diphtheria), of yeast (*Saccharomyces cerevisieæ*), and of the spores of a cryptogam (Lycopodium), respectively by Chargaff, by Newman and Anderson, and by Riebsomer and Johnson.

"There is some evidence that higher aquatic plants, including sub-aquatic grasses, have fat closely resembling freshwater algæ, while the work of Chibnall and others on the glycerides of forage grasses suggests the presence of unsaturated C_{18}– acids which are not identical with those typical of most seed fats. The component acids of the glycerides of the seeds (and, when present, of the pericarp or other fruit coat) of members of many plant families have, on the other hand, been widely studied in detail in recent years; especially, perhaps, at Liverpool. The first thing which is apparent, in contrast to fats of aquatic flora, is considerable simplification in the component fatty acids. As in the land animals, palmitic and oleic become the most consistently prominent features; but a third acid, linoleic, must be added to these as a component which is of most frequent occurrence. The latter acid is either absent, or only present in small quantities, in most fats of aquatic origin, but it, and the related still more unsaturated linoleic acid, are amongst the most familiar constituents of the widely distributed class of 'drying' seed oils.

"Fruit coat fats so far examined include (with at present only one exception) palmitic and oleic acids as sole major components, irrespective of the plant family in which they occur; linoleic acid is also frequently present, but usually only in minor quantities. In many seed fats, also, the bulk of the component acids is palmitic, oleic, and linoleic, in varying proportions; and, in general, seed fats of the same family have a certain resemblance in the relative proportions of these component acids. Malvaceæ and Bombacaceæ seed fats, for example, are usually high in their content of palmitic acid (20-25 per cent.) and also contain about 50 per cent. of linoleic acid. The latter acid is prominent in many seed fats of the conifers, of the larger dicotyledonous trees and shrubs, and in Rosaceæ, Compositæ, Labiatæ, Linaceæ, and other families, and also in those of Gramineæ, the component acids of most of which include about 10-15 per cent. of palmitic, 30-60 per cent. of oleic and 60-30 per cent. of linoleic.

"Land plants differ, however, from all other natural sources of fats in that, in many other families, their seed fats include as major components a fatty acid (or acids) different from any of those previously mentioned; in such cases the occurrence of the specific acid is almost wholly confined to one, or at the most to only a few, of the natural plant families. Thus the unsaturated erucic acid, $C_{22}H_{42}O_2$, is present in quantity in all Cruciferous seed fats: a structural isomeride of oleic acid, 'petroselinic acid,' is similarly found in seeds of the Umbelliferæ and the closely related ivy; and the cyclic unsaturated chaulmoogric and hydnocarpic acids in come of the Flacourtiaceæ. Of saturated acids, arachidic (C_{20}) and lignoceric (C_{24}), which occur in minute amounts in many seed fats, only attain major proportions in members of the Sapindaceæ and some of the Leguminosæ, whilst stearic acid (by no means so common a major component of fats as is usually supposed) is present in quantity only in the seed fats of a few tropical families. Saturated acids of lower molecular weight (lauric, C_{12}, myristic, C_{14}) are similarly characteristic of other, mainly tropical families; the composition of all Palmæ seed fats yet studied is remarkable for close quantitative similarity, with lauric (45-48 per cent.) and myristic (16-20 per cent.) as main components.

"Ivanow and others have pointed to climatic temperature as the factor mainly operative in determining the relative saturation of seed fats. Production, in plants of cooler latitudes, of fats solid at the prevailing temperatures of the atmosphere is in any case not very probable; but this is not evidence that the tropical temperature *per se* causes or favours development of the more saturated fats. Actually, many of the most unsaturated fats (those of *Aleurites, Hevea, Perilla, Licania* species, to quote only a few) are synthesised in the fruits of plants which can only live in tropical or subtropical conditions. On the other hand, in those plants which thrive equally in hot or cold climates, the investigators quoted have demonstrated a greater production of the characteristic unsaturated acids in seeds from plants grown in the cooler regions.

"In a few cases, as in *Ricinus communis, Picramnia* sp. or *Aleurites montana* and *Fordii,* the seed fats of one or two species of a genus elaborate quite distinct fatty acids—in the cases mentioned, respectively, ricinoleic (hydroxy-oleic), tariric (acetylenic) and elaeostearic (conjugated triethenoid). The last-named is at present quite exceptional, since it is quite an unusual plant fatty acid, and has yet been observed (in each case in isolated species only) in the three distinct families, Euphorbiaceæ Rosaceæ, and Cucurbitaceæ.

"Although the biosynthesis of these specific fatty components places many of the higher land plant families apart from the rest of Nature as regards their fat types, we are left with the circumstance that the occurrence of these unusual features runs on the whole remarkably parallel with the groups into which morphologists have placed them. Apart from the widespread occurrence of specific component acids in certain plant families, there is observed a (probably gradual) simplification in fatty acid composition, commencing from the aquatic flora and proceeding in the direction of the fruit fats of the more highly developed land plants, similar to that which may be traced in the animal world. The facts to which attention is here directed illustrate that consistent and well-defined changes in biochemical as well as in biological conditions have accompanied evolutionary development in Nature."

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CHEMOTHERAPY FOR STREPTOCOCCAL INFECTIONS

"The results of chemotherapy in bacterial as distinct from protozoal infections have always been inconclusive and disappointing," observes *The British Medical Journal* in its issue of March 21st, and proceeds: "The variety of counsel which prevails in face of generalised septic infection and the long list of reagents which have been hailed in turn as capable of influencing the course of such an infection by some action on bacteria in the blood stream or tissues are witnesses to the non-existence of any dependable remedy of this kind. It was therefore with unusual interest and hope that an audience listened in London last October to Professor Hörlein of Elberfeld,* whose associates have synthesised a long series of azo-compounds, one of which has been found capable of destroying streptococci in the body. This drug, which goes under the name of 'prontosil,' can be given by any of several routes, including the oral, and in the hands of German workers not only consistently protects mice which have been given a lethal dose of *Streptococcus pyogenes,* but has been used clinically in an extensive series of cases with results that are said to be favourable. Attempts in England to confirm these findings in animals have yielded less conclusive

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though still significant results, a difference probably dependent on the strains of streptococcus used and their antecedent history. Reports of clinical trials in this country are still wanting, although several have appeared on the Continent. Prontosil has no direct bactericidal action, and Professor Hörlein had no explanation to offer of the mechanism of its effect in the body. Such an explanation is now put forward by Levaditi and Vaisman, who have made an extensive study of the action of this drug and have obtained results in inoculated mice which are intermediate between the German and English findings already mentioned. Their belief is that prontosil renders streptococci susceptible to phagocytosis, and that it does this by destroying their capsules. The evidence for this proposition is not wholly convincing, and nothing in the paper suggests that its authors subscribe to the usual belief that most varieties of *Streptococcus pyogenes* are non-capsulated. But the idea of a change occurring *in vivo* for which there is no counterpart—at least in any loss of reproductive activity—*in vitro* fits the facts as they have been stated so far. There is, of course, no pretence of even conjecturing the nature of whatever chemical reactions may be concerned, but among a number of ways of pursuing this subject which suggest themselves one is a study of the capacity of this drug to interact with and possibly alter the properties of streptococcal toxins."

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NON-SPECIFIC PROTEIN THERAPY

The following leading article is reproduced from *The Lancet* of February 29th in the belief that it properly evaluates the merits of non-specific protein therapy, a form of treatment which we understand is now finding much favour at the hands of several of our veterinary colleagues.

"About twenty years ago it was shown that the course of typhoid fever is often favourably influenced by intravenous injections of typhoid vaccine. It was soon found that similar results could be got with *Bacillus coli* vaccine or albumose, and non-specific protein therapy dates from these observations. A great variety of proteins has since been used to treat an even greater variety of conditions, both acute and chronic. The American Council on Pharmacy and Chemistry, believing that there are many proprietary preparations of this type of unproved value, and that the indications for the use of non-specific protein therapy are not widely appreciated, has recently authorised the publication of two informative articles on the subject. In the first of these Cecil provides a critical review of the whole field. The three proteins most often used in the United States are typhoid vaccine, boiled milk, and diphtheria antitoxin, the latter being employed not because of its antitoxic property but because it is an available form of horse serum. Cecil thinks it very unlikely that any of the proprietary remedies offered as substitutes have any virtues not inherent in these substances, but the Gram-positive bacteria such as pneumococci are said to be less likely to cause febrile reactions than Gram-negative organisms such as typhoid bacilli, when given intravenously. It is essential, however, to distinguish sharply between the effects of intravenous and of intramuscular or subcutaneous injections. The two last provoke comparatively mild reactions, and there are very few patients indeed who cannot safely be given them. On the other hand, though such injections do no harm, they very often do no good, and Cecil believes that intravenous injection of typhoid vaccine is not dangerous, provided it is not applied to patients in a state of exhaustion, and that the first dose given is a small one. It is also wise to avoid treating patients who are known to be protein-sensitive, those who have active or quiescent pulmonary tuberculosis, and cases of congestive cardiac failure and hyperthyroidism.

"It is extremely difficult to assess the merits of any form of therapy in chronic disorders, especially in those characterised by natural remissions. It is therefore not surprising that opinions about the value of non-specific protein therapy in such conditions as chronic arthritis should be conflicting, though the balance of evidence is in favour of its trial, especially in early cases. Cecil holds that the greatest usefulness of protein injections is in acute and subacute infections, and in these it is usually possible to be surer that benefit is being obtained. The method having been first applied to typhoid fever, there are numerous series of cases on record treated by protein therapy, and with great success. In pneumonia, although the statistical evidence is distinctly in favour of protein fever therapy in Group IV cases, it is felt that this form of treatment is too drastic, especially as several fatalities have been recorded. In dementia paralytica malarial therapy holds a secure place, but although this is almost certainly a further example of protein therapy, there is as yet no certainty that injections of typhoid vaccine are equally efficient in bringing about a cure. In tabes dorsalis the results are less consistent, and in other diseases of the nervous system relief is the exception. Cecil states that protein therapy should always be considered for cases of acute arthritis, especially for those that do not respond to salicylates. The treatment of inflammatory diseases of the eye—especiallly acute iritis, uveitis, keratitis, and conjunctivitis—is the subject of numerous reports claiming successful results. In gynæcology, acute and subacute infections of the adnexa have often been treated by foreign proteins, and L. H. Stuhler, of the Mayo Clinic, goes so far as to say that if he were limited to one method of treatment in salpingitis, it would be this. In the treatment of allergic diseases and dermatological conditions reports are more conflicting, and striking improvement should not be expected. Of especial interest, perhaps, is the use of proteins in the treatment of diseases of the peripheral vessels, for which comparatively little can otherwise be done. G. E. Brown has described intravenous injections of typhoid vaccine as the best medical measure for the relief of the severe pain of thrombo-angiitis obliterans. N. W. Barker prefers typhoid H antigen, which when injected intravenously produces fever with fewer rigors than typhoid vaccine. And though the suggested mechanism is not the same, it may not be irrelevant to recall also the impressive results obtained from the use of muscle extract.

"A second paper, by Hektoen, deals in more detail with the changes which occur in the organism in response to foreign proteins. The benefit derived bears some relation, he believes, to the degree of the general reaction and of the fever. There is a dilatation of the vessels in the splanchnic area with contraction of the peripheral vessels, and it is this which gives rise to the rigors; later this state of affairs is reversed. At first there is a leucopenia which is followed by a leucocytosis. Numerous other alterations occur in the various chemical constituents of the blood, such as an increase in the proteolytic and lipolytic enzymes. It is surprising that it has not yet been determined whether the

normal antibodies and bactericidal constituents of the blood are increased in man in non-specific protein therapy, nor is it known whether in typhoid fever the production of specific antibodies is as great after typhoid vaccine has been given as after a non-specific protein. In some types of disorder, it may be, specific immune bodies are manufactured and assist the natural defences of the body; in others it is possible that the leucocytosis is the important reaction, and in yet others the fever, which by giving rise to vasodilatation floods the infected or injured tissues with antibodies. In vascular disease it is certain that the degree of vasodilatation is of prime importance, and in a sense the treatment here is specific rather than non-specific. There obviously remains a wide field for further research, not only into the practical value of the method, but also into the processes underlying it."

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HEAT REGULATION AND FEVER

In a recent issue *The Lancet* makes reference to the review of various aspects of the heat-regulating mechanism of the body given by Dr. John Beattie in his Arris and Gale lectures delivered before the Royal College of Surgeons, in which he expressed his belief that this mechanism is much more complicated than has hitherto been realised. "The notion that heat regulation is dominated completely by a single centre is in his opinion misleading, and he was able to show that sections at different levels of the central nervous system produce widely different effects. The argument in favour of a single centre has been founded largely on experimental demonstration that section of the cervical cord completely abolishes the heat-regulating mechanism so that the animals become poikilothermic. To support this conception there is also the older evidence from heat piqûre, and the more recent observations that local heating of the hypothalamus is followed by lowering of the body temperature, and local cooling by a rise in the body temperature. To the contrary, however, we have abundant clinical evidence, beginning with a case recorded by Brodie in 1837, that in man complete destruction of the cervical cord is not always followed by a loss of heat regulation and that even fever has been observed in such patients. A few isolated observations on animals are also on record, such as those of Goltz and Ewald in 1896, and the more recent one of Popoff,[1] where heat regulation was maintained after removal of the spinal cord from the cervical region downward with subsequent cutting of the vagus and sympathetic in the neck. In order to determine the reason for this contradiction, Thauer,[2] working in Bethe's laboratory, has lately carried out an extensive experimental reinvestigation of the effects of section of the cervical cord on a large number of rabbits, guinea-pigs, and rats. Suspecting that the discrepancies might be due to immediate shock effects masking the true results of the operation, he endeavoured to improve the operative technique and post-operative treatment. By keeping the animals immediately after the operation in a thermostat at 28°-30°C. and by careful attention to their feeding, he succeeded in keeping a number of animals alive for several weeks, and three rabbits for two months after the operation. In all these animals the heat-regulation mechanism was almost completely restored, although during the first few days after the operation it was severely impaired. When once the heat regulation had been restored subsequent cutting of the cervical sympathetic and of the vagi, and even subsequent partial removal of the thoracic spinal cord, failed to impair it. Thauer's results agree, therefore, with those of Popoff in showing that in warm-blooded animals after complete exclusion of the central nervous system the heat regulation of the body can be efficiently maintained by a peripheral mechanism. The nature of this peripheral mechanism has been indicated by the work of Cramer, who showed in his well-known monograph[3] that in addition to the nervous mechanism for heat regulation there is a humoral mechanism with which the thyroid and adrenal glands are particularly concerned. Since most of the factors concerned in heat regulation are controlled by the sympathetic nervous system, they can be brought into play either by nervous or by humoral stimulation. Thus fever can be produced experimentally by functional hyperactivity of the thyroid or adrenal glands, and Thauer has shown that his animals deprived of their central nervous control still respond to infections or to the injection of pyrogenic substances by fever.

"The experiments of Popoff and of Thauer must, of course, not be interpreted as denying the existence of a nervous mechanism for heat regulation or of a central coördination of such a mechanism. Such a conclusion would be as crude and as misleading as the reverse one that the thyroid or adrenal glands have no part in the processes of heat regulation because these processes can still be efficiently maintained after removal of one or other of these organs. We are being led to a belief that there are two mechanisms for heat regulation, one central and the other peripheral, a conception in keeping with modern physiological trends in other bodily functions. In the control of water metabolism, the control of equilibrium, and in sensory discrimination there are parallels for the overlaying of a crude peripheral type of regulation by a more delicate centralised one. On our present knowledge of heat regulation it must be supposed that the intracranial apparatus is not essential to an adequate working, but rather by allowing an interplay between the different peripheral factors serves to increase their efficiency, especially under pathological conditions.

"The conception of a single centre dominating heat regulation has tended to sterilise progress, and a study of Lakin's Lettsomian lectures[4] reveals how scarce investigations on the phenomenon of fever—one of the most frequent and important clinical symptoms—are in the recent physiological, pathological, and clinical literature. It is easy to understand why this should be so. On the unitary conception fever is explained as being due to some action on the heat-regulating centre in the brain which is likened to a thermostat, and in fever is supposed to be "set" at a higher temperature. But from what has been said above, and from what Dr. Beattié said in his lectures, it is clear that if there is a heat-sensitive zone in the brain there must also be other thermo-regulators outside it—represented perhaps by the sympathetic ganglia. Formerly it was assumed that the fever of infectious diseases is due to the action

[1] Popoff, N. F.: *Arch. f. d. ges. Physiol.*, 1934, ccxxxiv., 137.

[2] Thauer, R.: *Ibid*, 1935, ccxxxvi., 102.

[3] Cramer, W.: Fever, Heat Regulation, Climate, and the Thyroid-Adrenal Apparatus, London, 1928.

[4] Lakin, C. E.: Disturbances of the Body Temperature, *The Lancet*, 1934, ii., 467.

of bacterial toxins on cerebral centres; but it has now been shown that many bacterial toxins circulating in the blood cannot pass the blood-brain barrier,[5] which is additional evidence that their effects must be on the periphery. Moreover, it is now known that some pathological conditions of the thyroid or adrenal glands are associated with a pyrexia indistinguishable from that of an acute infection, for which in the past they have been frequently mistaken. This recent work on the decentralisation of sympathetic functions may well open up new fields for clinical applications in the pathogenesis and treatment of infectious diseases and of other pyrexial conditions whose origin is at present only surmised."

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WORLD CATTLE POPULATION

According to a survey made by the U.S. Bureau of Foreign and Domestic Commerce, there were in 1934 approximately 567,348,000 cattle in the world, the distribution by Continents being: Europe, 141,984,000; Asia, 185,541,000; Africa, 22,547,000; North America, 93,830,000; South America, 104,840,000; Australasia, 18,606,000.

The countries of the British Empire contribute about 37 per cent. of the world total, India being mainly responsible for the high percentage. Other important British cattle countries are: Australia, 12,545,000; South Africa, 10,754,000; Canada, 8,880,000; United Kingdom, 8,004,000.

India, with 167,000,000 head, is the greatest cattle country, the next in order being United States (67,350,000), Argentina (42,500,000), Soviet Russia (38,500,000), and Brazil (32,015,000).

The sheep population of the world is given as 649,502,000 head, Europe taking first place with 173,451,000, followed by Australasia, with 142,537,000; Asia, 104,926,000; South America, 98,988,000; Africa, 71,834,000; and North America, 57,766,000. Among the countries individually, Australia has pride of place with 113,008,000 head; United States, 51,500,000; Russia, 46,443,000; Argentina, 46,309,000; India, 45,117,000; South Africa, 43,680,000. No other country attains a 30,000,000 mark. The sheep population of the United Kingdom is given as 25,112,000 and the British Empire taken as a unit carries approximately 262,000,000 of the world total of 649,502,000 sheep, say, 40 per cent. —*Meat Trades Journal.*

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BIG FRIESIAN YIELDS

British Friesian cows with 2,000 gallon yields now number 719. The fourteenth British Friesian cow with four separate 2,000 gallon yields is Rednal Queenie, owned by Mrs. Butler, of Rednal, Birmingham. The cow has already produced in her lifetime 12,007 gallons, or 53 tons 12 cwts. 8¼ lb. Lord Rayleigh's Terling Beechnut 38th, that holds the British record (149½ lb.) for daily milk production, finished her lactation period yield with figures of 3,253 gallons in 365 days, and 1,190¼ lb. butter. British Friesian cows that have yielded upwards of 50 tons of milk now total 104, and those classed as producers of not less than 1,000 lb. butter in one year number 54.—*Farmers' Weekly.*

[5] Friedemann, V., and Elkeles, A.: *The Lancet*, 1934, i., 719.

The Suffolk Sheep Society has attained its jubilee. In 1886 there were 46 flocks, three of which are still in existence. To-day there are 357 flocks, 210 of which are in England and Wales, and Isle of Man, 63 in Scotland, and 84 in Ireland. Starting in the eastern counties of England, the breed was produced originally by crossing the improved Southdown with the now extinct Norfolk horned, and, as figures show, it is widely distributed throughout the lowland districts of the British Isles.

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The Editor does not hold himself responsible for the opinions of his correspondents.

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PROFESSIONAL TRAINING IN THE HUSBANDRY AND DISEASES OF FUR-BEARING ANIMALS AND OF BIRDS

To the Editor of The Veterinary Record

Sir,—I am surprised that you should have published a letter couched in such unwarranted phraseology as that of Dr. T. Hare's letter in the issue of *The Veterinary Record* of April 11th.

Until such time as Dr. T. Hare has apologised to the President of the Royal College of Veterinary Surgeons, I am not prepared to take any further part in the correspondence initiated by Dr. T. Hare.

I am, Sir,
Yours faithfully,
Geo. F. Boddie.

Royal (Dick) Veterinary College,
Edinburgh, 9.
April 13th, 1936.

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To Readers

We have had several enquiries as to whether or not the letter appearing over the name of Dr. Hare, in last week's issue of *The Veterinary Record*, reflects the policy and views of the N.V.M.A. We hasten to assert quite clearly that the views expressed in that letter were entirely those of Dr. Hare and must not be taken as representing the official views of this Association one way or the other.

The official views of the Association are to be found in the editorial articles, and not in the correspondence columns where a certain amount of latitude is permitted, in order that both sides of a question may be discussed.

It is unfortunate that some correspondents do not exercise the degree of restraint which is desirable.

Hamilton Kirk,
(*Chairman, Editorial Committee.*)

"Croyland,"
658, Finchley Road,
Golders Green, N.W.11.
April 15th, 1936.

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"ANTHRAX: DANGER OF SPREAD THROUGH EAR PUNCHING"

To the Editor of The Veterinary Record

Sir, Concerning the report of a recent prosecution in Banff, given under the above heading in the issue of the "*Record*," of March 28th, I think further details are necessary to explain the matter to your readers.

The accused dairy farmer noticed his bullock ill on Sunday, December 1st, saw that it was worse on the Monday and, selfishly, hurriedly sent it in to Banff Mart, where it passed for the subsidy (and incidentally the insurance examination for tuberculosis!); it was floated to Macduff slaughterhouse with four others. At the Mart it was down and with difficulty got into the float and with equal difficulty out of it at the slaughterhouse. About one hour later it was found dead. The critical point was that as the animal was eligible for the subsidy, it was ear-punched while in the last stages of anthrax and, of course, bled profusely, infecting the mart, the float and the four in-contacts.

All these in-contacts showed fever up to 109°F. in the subsequent three days. The lowest temperature was 103° persisting for several days. The animal showing 109° died on the fourth day, its temperature on the day of death being 102°F. about four hours before death and 100° one hour before death.

One other animal, whose temperature reached a maximum of 106°, quickly recovered; another, showing a similar temperature, recovered, later developed acute diarrhoea and then pneumonia, and died.

The important points were the ear punching, the fact that the blood of the first case was not black and tarry as is usually described in text-books, that several incisions were necessary before blood was obtained for smears and that both the animals dying from anthrax were ill for much longer than is usually given in text-books.

In this connection I might mention that in ten recent cases of anthrax in only one case was the history one of sudden death; all the others were seen ill either on the day of death or on the previous day.

In one case under close observation from December 2nd until it died on December 6th, the main symptoms shown were high fever (reaching 109°F. on the 5th), seriously ill appearance, the animal standing about with its head depressed, breathing becoming increasingly distressed and being laboured on the day of death, the blood-shot eyes; profuse sweating, and diarrhoea—not bloodstained—consisting chiefly of muscus. On the day the animal died it was very uneasy and constantly lay down and rose again, later being unable to rise.

I am,
Yours faithfully,

Drumblair House, Forgue, Aberdeenshire. W. M. McKay.

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TREATMENT OF CONTAGIOUS CONJUNCTIVITIS IN AUSTRALIAN PARRAKEETS

To the Editor of The Veterinary Record

Sir,—In reference to your article on bird diseases published in your issue of March 28th, it may be of interest to you to know that, in my experience, the only effective remedy for contagious conjunctivitis in Australian parrakeets is a solution of 1 :1000 perchloride of mercury dropped into the eye daily.

Yours truly,

62, St. James' Court, London, S.W.1. Tavistock.
April 7th, 1936.

The Editor acknowledges, with thanks, the receipt of the following:—

Report of a meeting of the Mid-West Division, N.V.M.A., from Mr. T. Roger Thomas, Hon. Secretary.

Report of Annual General Meeting of the Lancashire Division, N.V.M.A., from Mr. A. L. Mullen, Hon. Secretary.

Diseases of Animals Acts

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks reported by the Local Authorities.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 16th to 31st March, 1936	31	34	—	—	5	13	8	118	126
Corresponding period in									
1935	25	27	—	1	4	12	18	72	23
1934	22	24	1	31	6	13	18	66	33
1933	16	17	7	653	6	10	8	49	21
Total 1st January to 31st March, 1936	153	187	4	389	48	165	118	552	385
Corresponding period in									
1935	121	132	22	4,692	52	78	153	409	159
1934	123	125	1	31	65	112	282	429	242
1933	107	127	54	5,161	68	128	175	246	89

Note.—The figures for the current year are approximate only.

§ Excluding outbreaks in Army Horses.